SCIENTIFIC SECTION

Mathematics

Applications

By a group of supervisors

Interactive exams using QR CODE

EXERCISES

SECOND TERM 2 SEC. 2024

EL-MOASSER

Mathematics Applications

By a group of supervisors

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EXERCISES

SCIENTIFIC SECTION

GPS

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SECOND TERM 2 SEC.

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ومَن يخالف ذلك يتعرض للمساءلة القانونية طبقًا لأحكام القانون ٨٢ لسنة ٢٠٠٢ الخاص بحماية الملكية الفكرية.

Preface

Thanks to God who helped us to introduce one of our famous series **"El Moasser"** in mathematics.

We introduce this book to our colleagues.

We also introduce it to our students to help them study mathematics.

In fact, this book is the outcome of more than thirty years experience in the field of teaching mathematics.

This book will make students aware of all types of questions.

We would like to know your opinions about the book hoping that it will win your admiration.

We will be grateful if you send us your recommendations and your comments.

The Authors

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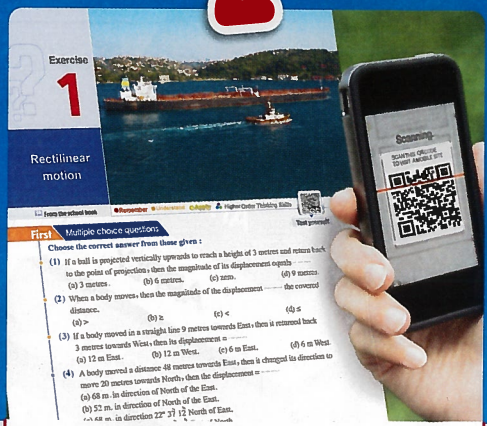


Open the application and scan the

QR code

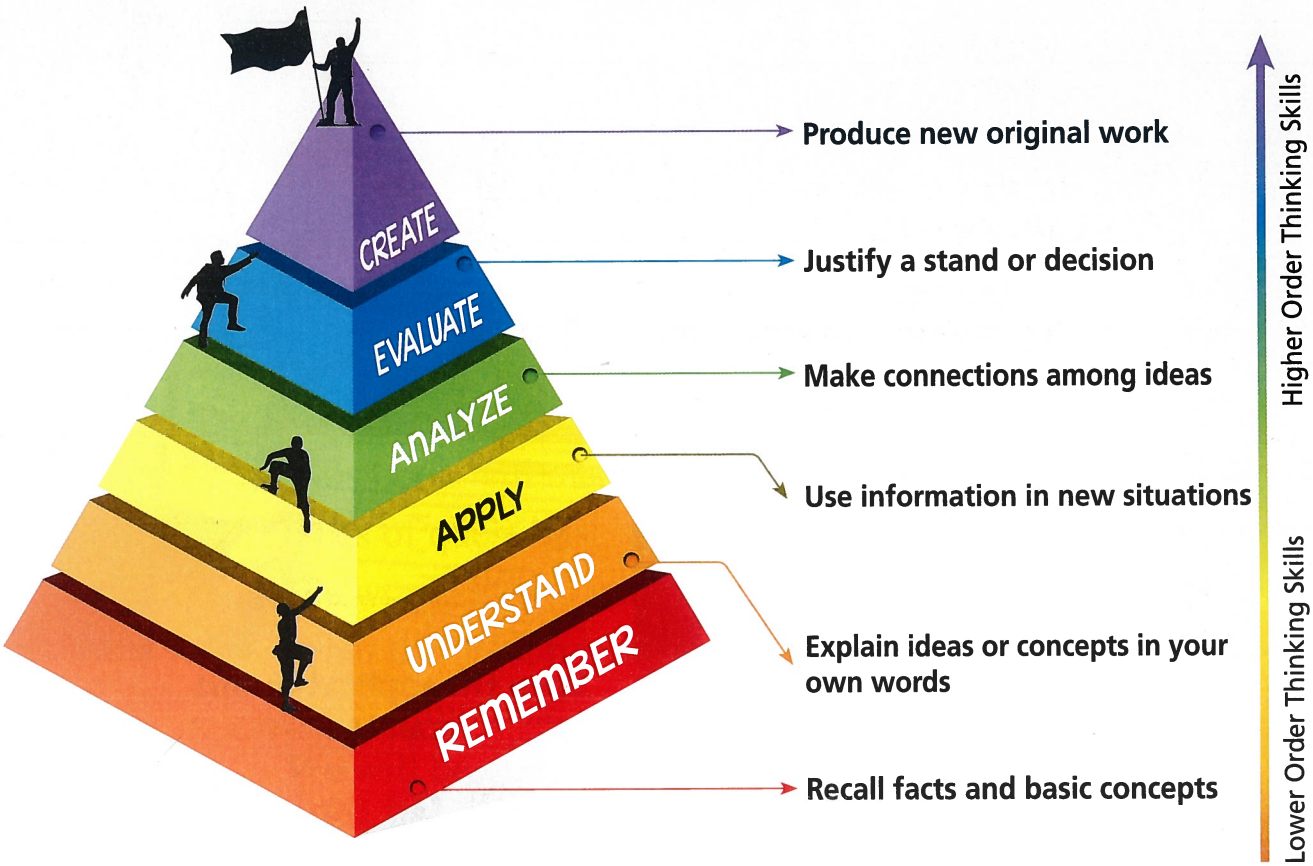
using phone's camera , then start solving directly.

- After finishing the test you can know your score to evaluate yourself showing a detailed report for your answers.

Bloom's Taxonomy Of Cognitive Levels

Bloom's Taxonomy is an educational classification created by Benjamin Bloom, it is often represented as a pyramid. This taxonomy was revised to include six cognitive levels graded form the lower level to the higher level as follows:

REMEMBER → UNDERSTAND → APPLY → ANALYZE → EVALUATE → CREATE



Bloom's Revised Pyramid

Note :

The questions within each exercise are classified according to the levels of Bloom's pyramid and are referred to as follows:

● REMEMBER ● UNDERSTAND ○ APPLY HIGHER ORDER THINKING SKILLS (HOTS)
(ANALYZE - EVALUATE - CREATE)

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Unit One

Dynamics

Exercise 1 — Rectilinear motion.

Exercise 2 — Rectilinear motion with uniformly accelerated.

Exercise 3 — Vertical motion under the effect of gravity (Free fall).

Exercise 4 — Newton's universal gravitation law.

Exercise

1

Rectilinear motion

From the school book

Remember Understand Apply Higher Order Thinking Skills

Test yourself

First Multiple choice questions

Choose the correct answer from those given :

(1) If a ball is projected vertically upwards to reach a height of 3 metres and return back to the point of projection, then the magnitude of its displacement equals .....

(a) 3 metres. (b) 6 metres. (c) zero. (d) 9 metres.

(2) When a body moves, then the magnitude of the displacement ..... the covered distance.

(a) $>$ (b) $\geq$ (c) $<$ (d) $\leq$

(3) If a body moved in a straight line 9 metres towards East, then it returned back 3 metres towards West, then its displacement = ...

(a) 12 m East. (b) 12 m West. (c) 6 m East. (d) 6 m West.

(4) A body moved a distance 48 metres towards East, then it changed its direction to move 20 metres towards North, then the displacement = ...

(a) 68 m. in direction of North of the East.

(b) 52 m. in direction of North of the East.

(c) 68 m. in direction $22^\circ\ 37\grave{}\ 12\grave{}\grave{}$ North of East.

(d) 52 m. in direction $67^\circ\ 22\grave{}\ 48\grave{}\grave{}$ East of North.

(5) A cyclist covered 6 km. towards West, then he moved afterwards 8 km. in the direction 60° South of the West, then the magnitude of the displacement that the cyclist moved = ... km.

(a) 14 (b) $2\sqrt{37}$ (c) $7\sqrt{3}$ (d) 12.1

(6) In the opposite figure :

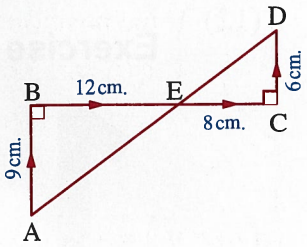
If each of $\overline{DC}$ and $\overline{AB}$ is perpendicular to $\overline{BC}$

If a body moved from A to B ,

then to C and stopped at D

Then (the distance covered by the body

+ the magnitude of the displacement) = ... cm.



(a) 35 (b) 70 (c) 25 (d) 60

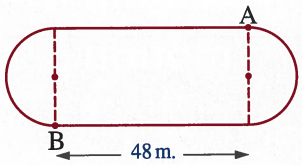
(7) In the opposite figure :

A racing track of length 140 m.

consists of two line segments and two half circles

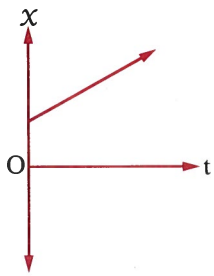
If a compitator starts at A and moves to point B

then his displacement = ... m. $\left(\pi = \frac{22}{7}\right)$

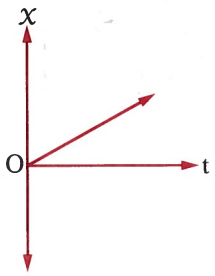


(a) 70 (b) 92 (c) 50 (d) 58

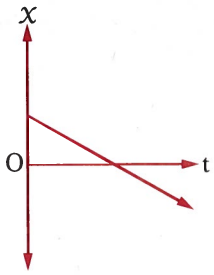
(8) Which of the following (position - time) graphs represents a displacement of a particle ?



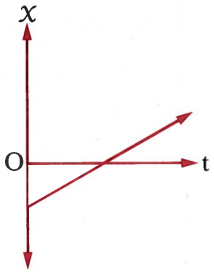
(a)



(b)



(c)



(d)

(9) The position vector of a body is given by the relation $\vec{r} = (t^2 - 9)\vec{i} + t\vec{j}$,

then the displacement vector $\vec{s}$ = ...

(a) $t^2\vec{i} + t\vec{j}$ (b) $9\vec{i} + t\vec{j}$ (c) $(t^2 - 9)\vec{i} + t\vec{j}$ (d) $-t^2\vec{i} - t\vec{j}$

(10) In orthogonal cartesian coordinate system.

If $\vec{A} = (-2, 3)$, $\vec{B} = (1, -1)$ are two position vectors of the points A and B , then the displacement vector from B to A = ...

(a) $3\vec{i} + 4\vec{j}$ (b) $-3\vec{i} + 4\vec{j}$ (c) $3\vec{i} - 4\vec{j}$ (d) $-\vec{i} + 2\vec{j}$

(11) A particle moves such that its position vector $\vec{r}$ is given as a function of time in terms of the two fundamental unit vectors $\vec{i}$ and $\vec{j}$ by the relation $\vec{r} = (6t - 3)\vec{i} + (8t + 1)\vec{j}$

then the displacement vector till t = 3 second is .....

(a) $18\hat{i} + 24\hat{j}$ (b) $15\hat{i} + 25\hat{j}$ (c) $14\hat{i} + 18\hat{j}$ (d) $15\hat{i} + 24\hat{j}$

(12) If the position vector of a particle moves in a straight line from a point is given as a function of time t in second by the relation : $\vec{r} = (2t^2 + 3)\vec{n}$, then the magnitude of displacement vector $\vec{s}$ after 2 seconds equal ..... length unit.

(a) 4 (b) 6 (c) 8 (d) 11

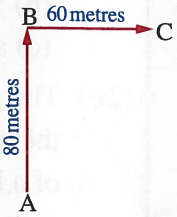
(13) If $\vec{s} = 4t\vec{i} - 3t\vec{j}$ and $\vec{r_o} = \vec{j} - 3\vec{i}$, then $\vec{r}$ = ... at t = 1

(a) $5\vec{i} - 6\vec{j}$ (b) $\vec{i} - 4\vec{j}$ (c) $\vec{i} - 2\vec{j}$ (d) $-7\vec{i} - 2\vec{j}$

(14) A particle moves such that its position vector $\vec{r}$ is given as a function of time in terms of $\vec{i}$ and $\vec{j}$ by the relation $\vec{r} = \left(\sin\frac{\pi}{2}t\right)\vec{i} + \left(\cos\frac{\pi}{2}t\right)\vec{j}$, then the magnitude of its displacement $\vec{s}$ till t = 1 second is .....

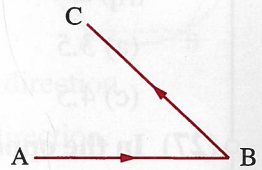
(a) 1 (b) 2 (c) $\sqrt{2}$ (d) $\sqrt{5}$

(15) A particle moved 80 metres in the North direction , then it moved 60 metres in the East direction , then the ratio between the covered distance and the magnitude of its displacement is .....



(a) 1 : 1 (b) 4 : 3 (c) 5 : 7 (d) 7 : 5

(16) The opposite figure represents the motion of a body moves from A to B , then to C and stops at C If $\| \overrightarrow{AB} \| = 8$ m. , $\| \overrightarrow{BC} \| = 5$ m , m (∠ ABC) = 60° , then : .....



(The covered distance – the magnitude of displacement) = ... m.

(a) 6 (b) 7 (c) 13 (d) 20

(17) 20 m./sec. = ... km./hr.

(a) $\frac{50}{9}$ (b) 72 (c) 0.18 (d) 20

(18) 45 km./minute = ... m./sec.

(a) 750 (b) 12.5 (c) 162 (d) 0.75

(19) 150 cm./sec. = ... m./h.

(a) 5400 (b) 540 (c) 54 (d) 5.4

(20) 6 m./h. = ... mm./min.

(a) 10 (b) 100 (c) 1000 (d) 10000

(21) If a car moves with uniform speed 75 km./hr. for 20 minutes, then the covered distance equals ..... km.

(a) 15 (b) 20 (c) 25 (d) 30

(22) A car covered a distance of 180 km. with velocity magnitude 20 m./sec. on a straight road, then the time taken to cover this distance = ... hr.

(a) $1\frac{1}{2}$ (b) 2 (c) $2\frac{1}{2}$ (d) 3

(23) If the sun light reaches the Earth in time = 8.3 minutes , if the sun is far from the Earth by 1.494×10^{11} metres , then the speed of the light ..... km./sec.

(a) 1.8×10^{10} (b) 300 (c) 300000 (d) 3×10^{8}

(24) A car covered a distance 180 km. within 120 minutes , then its average speed equals ..... km./hr.

(a) 90 (b) 1.5 (c) 180 (d) 25

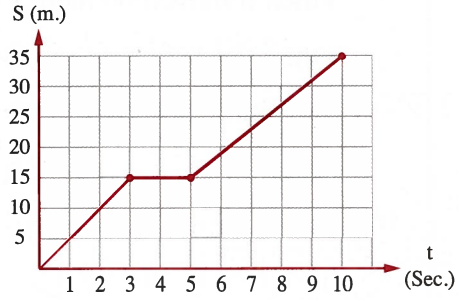
(25) When does the average speed be equal to the instanteneous speed ?

(a) When the speed increases at constant rate.

(b) When the speed is constant.

(c) always. (d) never happen.

(26) The given figure represents the relation between the algebraic measure of displacement and time of a body moves in a straight line , then the average speed of the body during the whole trip = ... m./sec.



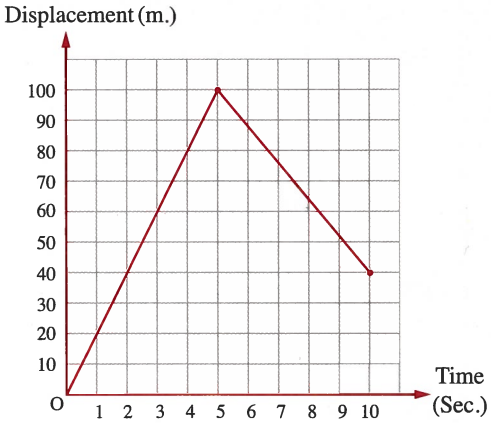
(a) 3.5 (b) 4

(c) 4.5 (d) 5

(27) In the opposite figure :

A cyclist moves from (O) in a straight line then :

First : Magnitude of the average velocity during the whole journey = ... m./sec.



(a) 2 (b) 4

(c) 14 (d) 16

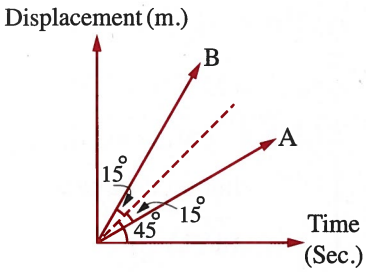
Second : The average speed during the whole journey = ... m./sec.

(a) 2 (b) 4

(c) 14 (d) 16

(28) Two cars A and B moving in the same straight line and their speeds were

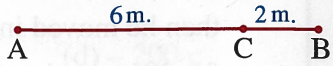
v_A and v_B respectively , then $\frac{v_A}{v_B}$ = ...



(a) 1 : 3 (b) 1 : 2

(c) 3 : 1 (d) 2 : 1

(29) In the opposite figure :

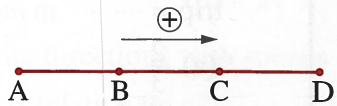


A man moves from point A to point B in 4 seconds , then he reversed his direction to point C in 1 second , then his average velocity = ...

(a) 2 m./sec. in $\overrightarrow{AB}$ direction. (b) 1.2 m./sec. in $\overrightarrow{AB}$ direction.

(c) 2 m./sec. in $\overrightarrow{BC}$ direction. (d) 1.2 m./sec. in $\overrightarrow{BC}$ direction.

(30) Use the opposite figure to determine in which of the following situations the algebraic measure of average velocity is negative.



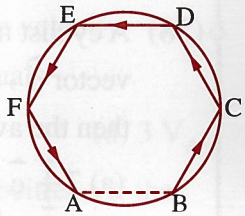
(a) The body moves from A to D

(b) The body moves from A to C , then back to B

(c) The body moves from B to D , then back to B

(d) The body moves from C to D , then back to A

(31) In the opposite figure :

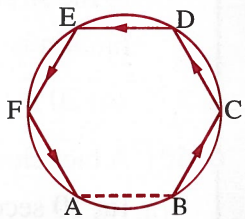


A particle moves along the sides of a regular hexagon , the length of its side is 24 m. The particle moves from B and passes through C , D , E , F to point A with speed 10 m./sec. , then the average velocity of the particle is .....

(a) 12 m./sec. in $\overrightarrow{AB}$ direction. (b) 10 m./sec. in $\overrightarrow{BA}$ direction.

(c) 2.4 m./sec. in $\overrightarrow{AB}$ direction. (d) 2 m./sec. in $\overrightarrow{BA}$ direction.

(32) In the opposite figure :



A particle moves along the sides of a regular hexagon of side length 24 m. The particle moves from B to C in 2 sec. from C to D in 3 sec. , from D to E in 4 sec. , from E to F in 5 sec. and from F to A in 6 sec. , then its average speed during its journey from B to A equals ..... m./sec.

(a) 1.2 (b) 2.4 (c) 3 (d) 6

(33) A car moves in a straight line , it covered a distance 360 km. in 240 minutes , then it covered 120 km. in the same direction during 60 minutes , then its average speed = ... km./h.

(a) 105 (b) 120 (c) 96 (d) 80

(34) If a car covered 100 km. in the direction of East in $1\frac{1}{4}$ hour , then it covered 60 km. in the direction of West in $\frac{3}{4}$ hour , then its average velocity vector = ... $\vec{n}$ where $\vec{n}$ is the unit vector in the East direction and magnitude of velocity in km./hr.

(a) 20 (b) 60 (c) 40 (d) 80

(35) From a fixed point a man moved 240 metres in the East direction in two minutes , then he moved in the direction of West with uniform velocity of magnitude 8 m./sec. for 30 seconds , then the magnitude of his average velocity is .....

(a) zero (b) 2 m./sec. (c) 3.2 m./sec. (d) 5 m./sec.

(36) A body moves in a straight line 100 m. with speed 5 m./sec. then it moves with speed 8 m./sec. in the same direction for 10 sec. then the average speed during the whole trip = ... m./sec.

(a) $\frac{2}{3}$ (b) 6 (c) 8 (d) 9

(37) A cyclist covered a distance 60 km. towards West , then he covered a distance 90 km. towards East. If the cyclist travelled with constant speed 12 km./hr., then the average velocity during the whole trip = ...

(a) 12.5 km./hr. towards East. (b) 12 km./hr. towards East.

(c) 12 km./hr. towards West. (d) 2.4 km./hr. towards East.

(38) A cyclist moved 40 km. on a straight road with speed 20 km./h. in direction of a unit vector $\vec{c}$, then he covered 15 km. in the opposite direction with speed 15 km./h. , then the average velocity during the whole trip = ...

(a) $7\frac{1}{2}\vec{c}$ (b) $21\frac{2}{3}\vec{c}$ (c) $\frac{55}{3}\vec{c}$ (d) $8\frac{1}{3}\vec{c}$

(39) A particle moves in a straight line from a fixed point (O) such that its position vector $\vec{r}$ is given by the relation $\vec{r} = (t^2 + 3t + 5)\vec{n}$ where $\vec{n}$ is a unit vector parallel to the straight line. then the average velocity after 3 seconds from the beginning of motion is .....

(a) $20\vec{n}$ (b) $\frac{20}{3}\vec{n}$ (c) $6\vec{n}$ (d) $18\vec{n}$

(40) A bicycle moves with velocity 4 m./sec. towards East for 60 seconds , then it stopped for 10 seconds , later it moves with velocity 5 m./sec. towards West for 30 seconds , then the average speed within the whole trip = ... m./sec.

(a) 0.9 (b) 5.6 (c) 1 (d) 3.9

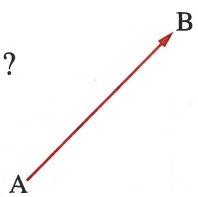
(41) A body moves with uniform speed 50 m./sec. from point A (2 , 1) to point B (9 , 25) , then the velocity of the body = ...

(a) $7\vec{i} + 24\vec{j}$ (b) $8\vec{i} + 24\vec{j}$ (c) $14\vec{i} + 48\vec{j}$ (d) $50\vec{i}$

(42) A particle moves with velocity $\vec{v} = 3\vec{i} - 2\vec{j}$ from the point A (1 , 7) to the point B in two seconds , what are the coordinates of the point B ?

(a) (7 , 3) (b) (4 , 5)

(c) (5 , – 11) (d) (2 , – 9)



(43) If $\vec{v}_A = 120\,\vec{c}$, $\vec{v}_B = -80\,\vec{c}$, then $\vec{v}_{BA}$ = ...

(a) $40\,\vec{c}$ (b) $-40\,\vec{c}$ (c) $200\,\vec{c}$ (d) $-200\,\vec{c}$

(44) A cyclist (A) moves on a straight road with speed 15 km./hr. If another cyclist (B) moves with a speed of 12 km./hr. on the same direction , then the algebraic measure of the velocity of B with respect to A equals ..... km./hr.

(a) 3 (b) – 3 (c) 27 (d) – 27

(45) Two cars A and B moves on the same straight road in opposite directions with speeds 125 km./hr. , 75 km./hr. respectively , then the speed of car B relative to the car A = ...

(a) 50 (b) – 50 (c) 200 (d) 75

(46) If $\vec{v}_{AB} = 15\,\vec{i}$, $\vec{v}_A = 35\,\vec{i}$, then $\vec{v}_B$ = ...

(a) $-50\,\vec{i}$ (b) $-20\,\vec{i}$ (c) $20\,\vec{i}$ (d) $50\,\vec{i}$

(47) A and B are two bodies move in two opposite directions , if the velocity magnitude of A is twice the velocity magnitude of B , then v_{AB} equals .....

(a) 1.5 V_A (b) 2 V_A (c) 2.5 V_A (d) 3 V_A

(48) The distance between two aircrafts 10 km. and they have same velocities , if the aircraft behind fired a missile with speed 150 km./h. , then it hits the front aircraft after ..... minute (s).

(a) 1 (b) 2 (c) 3 (d) 4

(49) A and B are two bodies moving on a straight line in the direction $\overrightarrow{BA}$ with velocities 1000 m./min. , 120 km./hr. If the distance between them was 30 km. , then they will meet at a distance ..... km. from the point where B starts its motion.

(a) 30 (b) 60 (c) 20 (d) 40

(50) The distance between two cities A and B is 120 km. A car moved from the city A towards the city B with a velocity of 88 km./hr. At the same moment, another car moved from the city B towards the city A with a uniform velocity of 72 km./hr. , then the two cars will meet at a distance ..... km. from A.

(a) 54 (b) 90 (c) 80 (d) 66

(51) A motorcycle moves with speed 40 km./hr. in direction of a fixed unit vector $\vec{c}$, its rider watches a car , it seems to him that it moves in the opposite direction with speed 105 km./hr. , then the velocity of the car is .....

(a) $155\,\vec{c}$ (b) $-65\,\vec{c}$ (c) $65\,\vec{c}$ (d) $-155\,\vec{c}$

(52) A monitoring car on highway , moves with velocity 25 km./hr. It observed a car seemed to move with velocity 100 km./hr. , then the actual velocity of car is ..... km./hr. Given that the two cars moving in the same direction.

(a) 175 (b) 75 (c) 125 (d) 225

(53) Two trains A and B , the length of each is 50 m. They are moving in opposite directions with velocities 10 m./sec. and 15 m./sec. , then the time taken to cross each other = ... sec.

(a) 2 (b) 4 (c) 6 (d) 8

(54) Two trains A and B , the length of each is 50 m. They are moving in the same direction with velocities 10 m./sec. and 15 m./sec. and train B behind A , then the time the train (B) takes to cross train (A) = ... sec.

(a) 5 (b) 10 (c) 15 (d) 20

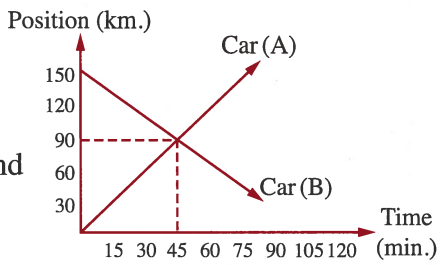
(55) Two cars A and B are moving on the same road and in the same direction with velocities v_A and v_B respectively. v_{AB} is the algebraic measure of the velocity of A with respect to B. If the car A increases its velocity 3 units , then v_{AB} .....

(a) will increase 3 units. (b) will decrease 3 units.

(c) will be three times its value. (d) will be the same.

(56) In the opposite figure :

Two cars A and B are moving in the same straight line. v_A is the velocity of car A when it moves from a town to another and v_B is the velocity of the second car when it moves from the second town to the first one , then v_{AB} = ... km./hr.



(a) 40 (b) 80 (c) 120 (d) 200

Second Essay questions

1 A car covered the distance between Cairo and Ismailia which equals 120 km. on two stages. The first, its distance is 40 km. with speed 80 km./hr. and the second stage is of distance 80 km. with speed 60 km./hr. If we considered that the car moves all time on a straight road and the car stopped after covering the first stage for 10 minutes. Find the average velocity during the whole trip.

« 60 km./hr. in the direction of motion from cairo to Ismailia »

2 A cyclist moved on a straight road. He covered a distance 27 km. with velocity 18 km./hr. , then he covered 36 km. with velocity 12 km./hr. Find the average velocity during the whole trip if :

(1) The two displacements are in the same direction.

« 14 km./hr. in the same direction of the two displacements »

(2) The two displacements are in opposite directions.

« 2 km./hr. in the direction of the second displacement »

---

3 If a body at two moments 2 and 6 seconds from starting motion was at the two positions A (3 , 5) , B (7 , 25) respectively. Find the average velocity of the body during this time interval , then find the norm and the direction of this average velocity.

« $\vec{i} + 5\vec{j}$, $\sqrt{26}$ length unit / second , 78° 41` 24`` with $\overrightarrow{OX}$ »

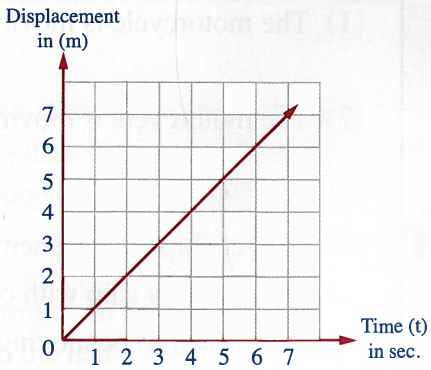
---

4 A train of length 150 metres entered a straight tunnel of length s metres. It took the entire crossing of the tunnel a time of 15 seconds. Find the length of the tunnel if the train moves with uniform velocity equals 90 km./hr.

« 225 metres »

---

5 The opposite figure represents graphically the curve of (displacement-time) of a rat escaping from a cat. Draw this figure again if the rat escaped from the cat with velocity equals double the first velocity.



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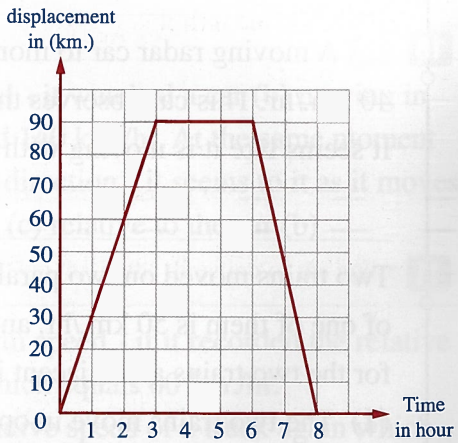
6 The opposite figure shows the relation between the displacement in km. and the time in hours of the path of a motorcycle moving between two cities. Answer the following :

(1) What is the magnitude of the average velocity of the motorcycle during travelling ?

(2) What is the magnitude of the average velocity of the motorcycle during returning back ?

(3) What is the description of the horizontal line segment shown in the opposite figure ?



« 30 km./hr. , 45 km./hr. »

7 The opposite figure shows the path of the motion of each of Ahmed and Amr to cover the distance between two villages one of them is at the first village and the other is at the second village.

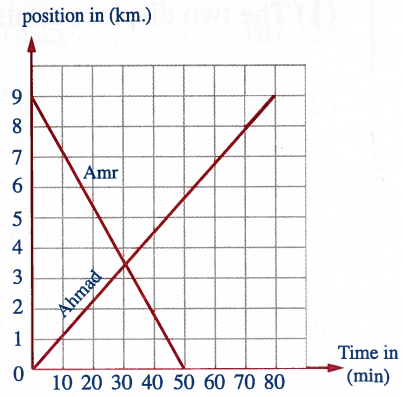
(1) Do Ahmed and Amr start motion in the same moment ? explain

(2) After how many minutes did Ahmed and Amr meet ?

(3) What is the time taken by Ahmed to cover the distance ?

(4) Find the speed of Amr.

(5) If Amr start motion at 9 : 30 am. , so when does he reach the other village ?



« yes , 30 minutes , 80 minutes , 0.18 km./min. , 10 : 20 am. »

---

8 A car moves on a straight road with a speed 80 km./hr. If a motorcycle moves with a speed of 30 km./hr. Find the relative velocity of the motorcycle relative to the car if :

(1) The motorcycle is moving in the same direction as the car.

« 50 km./hr. in opposite direction of the car »

(2) The motorcycle is moving in opposite direction of the car.

« 110 km./hr. in opposite direction of the car »

---

9 A destroyer ship and an enemy ship are moving in a straight line. If the destroyer ship follow the enemy ship with constant speed 60 km./hr. , the enemy ship seems to the captain of the destroyer to be moving towards him with speed 20 km./hr. Find the actual speed of the enemy ship.

« 40 km./hr. »

---

10 A moving radar car to monitor the velocity on the desert road moves with speed 40 km./hr. This car observes the movement of a truck coming in the opposite direction. It seems like it is moving with speed 120 km./hr. What is the actual speed for the truck ?

« 80 km./hr. »

---

11 Two trains moved on two parallel lines. The distance between them is 3.5 km. if the speed of one of them is 50 km./hr. and the speed of the other is 20 km./hr. Find the time taken for the two trains are adjacent if :

(1) The two trains move in opposite directions face to face.

« after 3 minutes »

(2) The two trains move in the same direction. (The faster one is in the back)

« after 7 minutes »

12 A and B are two cars moving on a straight road with the speeds 60 km./hr. and 90 km./hr. in the direction $\overrightarrow{BA}$:

(1) Find the velocity of B relative to A

(2) Find the velocity of A relative to B

(3) If the distance between them is 10 km. , find the elapsed time to be adjacent.

« 30 km./hr. in the direction $\overrightarrow{BA}$, 30 km./hr. in the direction $\overrightarrow{AB}$, 20 minutes »

---

13 Two cars are moving on the same straight road in opposite directions. If the distance between them is 4 km. and the speed of one of them is 70 km./hr. , they met after two minutes. What is the actual speed of the other car ?

« 50 km./hr. »

---

14 Two aeroplanes fly at the same speed in a straight line while one of them is following the other with a distance 500 m. apart. At a certain moment the one behind launched a rocket at the leading one. This rocket reached the leading one after 2 seconds of its launching What is the velocity of the rocket ?

« 250 m./sec. »

---

15 A fighter aeroplane follows bomber , they are moving in the same straight line in the same speed and direction. If the distance between them is 20 km. when the fighter launched a rocket with total speed 1200 km./hr. , it reached the bomber after 4 minutes. Find the speed of each of the fighter and bomber.

« 900 km./hr. »

---

16 A car (A) moving on a straight road measured the relative speed of a car (B) coming in the opposite direction , it found it equals 120 km./hr. , then the car (A) doubled its speed , then it remeasured the relative speed of (B) it found it becomes 180 km./hr. Find the actual speed of each of the two cars.

« 60 km./hr. , 60 km./hr. »

---

17 When a car (A) measures the relative speed of a car (B) coming in the opposite direction it found it 130 km./hr. , then the car (A) reduced its speed to the half , then it remeasured the relative speed of (B) to find it 110 km./hr.
Find the actual speed of each of the two cars.

« 40 km./hr. , 90 km./hr. »

---

18 During the motion of a police car (a) on a straight road , it watched a car (b) moving in the opposite direction. It seems as it moves with speed 140 km./hr. At the same moment the police car watched a lorry (c) moving in the same direction , it seems to it as it moves with speed 60 km./hr. Calculate the speed of the lorry (c) relative to the car (b)

« 200 km./hr. in the direction of the police car »

---

19 🕮 A police car moves in a straight line with a uniform speed , if it recorded the relative speed of a truck moves in its direction in front of it which equals 60 km./hr.
the police car doubles its speed , and recorded the relative speed of a truck again which seems to be at rest. Find the real velocity of each of the police car and the truck.

« 60 km./hr. , 120 km./hr. in the same direction »

20 When the police car (a) moves on a straight road with speed 42 km./hr. , it watched another car (b) and bicycle (c) moving on the same road , it seems to it that the car (b) is coming in the opposite direction with speed 132 km./hr. and with respect to the bicycle , it seems that the bicycle moves backwards in speed 12 km./hr. Find the actual speed of each of the car b and the bicycle (c)

« 90 km./hr. in the opposite direction of the police car , 30 km./hr. in the same direction of the police car »

21 A cruiser and a ship are moving in the same straight line towards each other. The cruiser watched the ship and when it is 20 km. apart from it and moving with 40 km./hr. the cruiser fired a torpedo with a speed 108 km./hr. If the speed of the cruiser was 52 km./hr. at that moment , then find the time elapsed until the torpid targeted the ship. « 6 min. »

22 A train (a) of length 80 metres moves with speed 120 km./hr. passed with another train (b) of length 120 metres. Find the required time in order to the train (a) passes completely from the train (b) if the train (b) :

(1) Is at rest.

(2) Is moving with velocity 70 km./hr. in the same direction as (a)

(3) Is moving with velocity 80 km./hr. in the opposite direction of (a)

« 6 sec. , 14.4 sec. , 3.6 sec. »

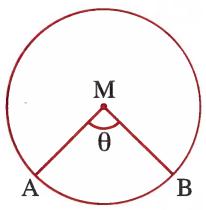
23 A train (a) moves with speed 100 km./hr. catches another train (b) of length 190 metres and moves with speed 60 km./hr. The two trains are moving on two parallel lines. If (a) passed completely the train (b) in 27 seconds , then find the length of the train (a) , find also the time can be taken to let the train (a) crosses a bridge of length 90 metres.

« 110 metres , 7.2 sec. »

Third Higher skills

1 **Choose the correct answer from those given :**

(1) In the opposite figure :



A particle moves from A to B on the circle with radius length r , then its displacement = ...

(a) $r\ \theta^{rad}$ (b) $2\ r\ \theta^{rad}$ (c) $r \sin \theta$ (d) $2\ r \sin \frac{\theta}{2}$

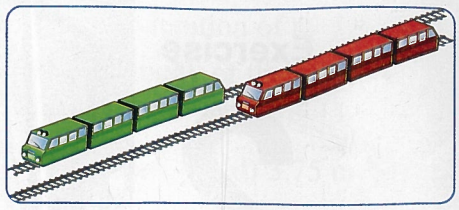
(2) If a particle moves distance (s) with speed (v_1) then moves in the same direction distance (s) with speed (v_2) then the average speed is .....

(a) $\frac{1}{2}(v_1 + v_2)$ (b) $\frac{1}{2}\ s\left(\frac{1}{v_1} + \frac{1}{v_2}\right)$ (c) $\frac{2\ v_1\ v_2}{v_1 + v_2}$ (d) $\frac{2}{s}(v_1 + v_2)$

(3) If a body moves with speed 14 km./h. , it covers a distance 20 km. more than if it moves with speed 10 km./h. , then the covered distance if the body moves with speed 14 km./h. is ..... km.

(a) 50 (b) 56 (c) 70 (d) 80

(4) Two trains of the same length move in the same direction on two parallel railways , the speed of the first train is 46 km./h. and the speed of the second is 36 km./h. If the faster train passes the slower train. Completely in 36 seconds , then the length of each train = ... m.



(a) 25 (b) 50 (c) 75 (d) 100

(5) A competitor runs around a track consists of two parallel lines , the length of each is 96 m. and joined together at each end by semicircle its radius length is 49 m. If the competitor finish a complete round in 100 seconds , then the magnitude of its average velocity = ... m./sec. $\left(\pi = \frac{22}{7}\right)$

(a) 2.5 (b) 5 (c) 10 (d) zero

(6) A train moves with constant speed 15 m./sec. passes a man at rest in 27 sec. , then the time needed to the same train to pass a platform of length 150 m. completely equals ..... sec.

(a) 27 (b) 30 (c) 37 (d) 42

(7) A car moved 30 km. with constant speed 30 km./h. , then continue in the same direction 90 km. with speed (v). If the average speed of the car through the whole trip is 40 km./h. then v = ... km./h.

(a) 30 (b) 60 (c) 45 (d) 120

(8) Two trains moving in opposite directions pass a man at rest on a platform in 27 sec. and 17 sec. respectively and pass each other completely in 23 sec. , then the ratio between their speeds = ...

(a) 1 : 3 (b) 1 : 12 (c) 3 : 2 (d) 3 : 4

2 A helicopter flies in a straight line with speed 126 km./hr. above a train moving in the same direction. The helicopter reached from the behind end of the train to its forward end with 15 seconds. When the leader of the helicopter reduces its velocity to the half , the helicopter became above the behind end within 20 sec. Find the length of the train in metre.

« 150 metres »

3 A man walks on a bridge AB , and when he covers $\frac{3}{8}$ of the bridge length from the point A he heard a beep sound of a train moves behind him with a uniform velocity 60 km./hr. towards the point A if the man moves toward the train , then the train will hit him directly at the point A

Find the lower uniform speed that the man must moves with , before getting crushed by the train directly at the point B

« 15 km./hr. »

Exercise

2

Rectilinear motion with uniformly accelerated

From the school book | Remember | Understand | Apply | Higher Order Thinking Skills | Test yourself

First Multiple choice questions

Choose the correct answer from those given :

(1) 180 m./hr./sec. = ... cm./sec.^{2}

(a) $\frac{1}{20}$ (b) 5 (c) 30 (d) 300

(2) At the beginning of motion of a body , always ..... = zero.

(a) v_o (b) v (c) t (d) a

(3) If a particle is moving with uniform velocity , then a = ...

(a) a positive number. (b) a negative number. (c) zero. (d) v

(4) If a particle moved in a straight line , then returned to its initial position , then .....

(a) $v = v_o$ (b) $a = 0$ (c) $s = 0$ (d) $v = 0$

(5) When a particle reaches to its maximum distance , then .....

(a) $a = 0$ (b) $v = 0$ (c) $vt = s$ (d) $v = v_o$

(6) The algebraic measure of acceleration of a moving body can be calculated graphically by .....

(a) the slope of the curve of the velocity-time graph.
(b) the area under the curve of velocity-time graph.
(c) the slope of the curve of the displacement-time graph.
(d) the area under the curve of the displacement-time graph.

(7) If the curve of the speed is represented by a horizontal segment above the time axis in the speed-time graph , then the body .....

(a) moves with zero acceleration.
(b) moves with uniform non-zero acceleration.
(c) is at rest. (d) moves with increasing speed.

(8) A car is moving in a straight line from rest with uniform acceleration of magnitude 25 cm./sec.^{2} in the same direction of the car motion , then velocity of the car after $\frac{1}{4}$ minute = ...

(a) 375 m./sec. (b) – 3.75 m./sec. (c) 3.75 cm./sec. (d) 3.75 m./sec.

(9) An airplane increases its speed at the rate 15 m./sec.^{2} , then the time needed to increase its speed from 100 m./sec. to 160 m./sec. is ..... sec.

(a) 17 (b) 0.05 (c) 4 (d) 1.25

(10) A particle moves in a straight line with uniform acceleration of magnitude 8 cm./sec.^{2} in the opposite direction of its initial velocity whose magnitude is 4 m./sec. , then the velocity of the particle after $\frac{1}{2}$ minute from starting motion = ...

(a) 1.6 m./sec.^{2} (b) 16 cm./sec. (c) 5.76 km./hr. (d) zero

(11) A plane accelerates on a runway at a rate of 3 m./sec.^{2} where taking off velocity is of magnitude 96 m./sec. , then the elapsed time from starting motion from rest to the taking off = ... sec.

(a) 25 (b) 32 (c) 37 (d) 42

(12) A particle started its motion with velocity 24 m./sec. and with retardation 8 m./sec.^{2} , then the particle stopped after ..... sec.

(a) 3 (b) 16 (c) $\frac{1}{3}$ (d) 30

(13) A particle moves in a straight line with uniform retardation of magnitude 3 m./sec.^{2} to become at rest after 19 seconds. , then the magnitude of the initial velocity = ... m./sec.

(a) 16 (b) 54 (c) 60 (d) 57

(14) 📖 The distance which a particle covered in a constant direction from rest with an acceleration of magnitude 5 cm./sec.^{2} during a time of magnitude 4 seconds = ... cm.

(a) 10 (b) 20 (c) 40 (d) 80

(15) 📖 If a particle started its motion with velocity 30 cm./sec. and with uniform acceleration 5 cm./sec.^{2} in the same direction of its initial velocity , then the covered distance after 10 seconds. from starting motion = ... cm.

(a) 550 (b) 300 (c) 750 (d) 1500

(16) A particle is moving in a straight line with initial velocity of magnitude 7 m./sec. and uniform acceleration of magnitude 4 m./sec.^{2} in opposite direction of its initial velocity , then magnitude of displacement after 6 seconds = ... m.

(a) – 30 (b) 15 (c) 45 (d) 30

(17) If a particle moves in a straight line with uniform acceleration , then $v + v_o$ = ...

(a) $\frac{2s}{t}$ (b) $\frac{s}{t}$ (c) $\frac{s}{2t}$ (d) 2 s t

(18) If a particle moves in a straight line from rest with uniform variable motion , then the displacement of the particle (s) $\propto$ .....

(a) t (b) v (c) t^2 (d) a

(19) A particle moves in a straight line with acceleration 40 cm./sec^2. in the direction of the initial velocity. If the magnitude of the displacement is 35 metres in the same direction of starting motion after 10 seconds. , then the magnitude of the initial velocity = ... m./sec.

(a) 1.5 (b) 150 (c) 2.5 (d) 2

(20) A particle moves in a straight line with uniform acceleration of 40 cm./sec^2. and initial velocity 36 km./hr. in the same direction of the acceleration , then the particle become at a distance 43.2 metres from the starting point after ..... seconds.

(a) 2.7 (b) 3.8 (c) 4 (d) 3.5

(21) A particle moves from rest in a straight line with uniform acceleration. it covered 24 m. in the first four seconds of starting its motion , then the magnitude of its acceleration = ... m./sec^2

(a) 3 (b) 6 (c) 12 (d) $\frac{3}{2}$

(22) A ball is projected horizontally against direction of wind with initial speed v_o = 15 cm./sec. to move with uniform deceleration 5 cm./sec.^{2} , then the time elapsed till the ball returned to its initial position = ... sec.

(a) 2 (b) 3 (c) 4 (d) 6

(23) A particle started its motion from rest in a straight line with uniform acceleration 3 cm./sec^2. It covered a distance 24 cm. , then its velocity at the end of this distance = ... cm./sec.

(a) 144 (b) 12 (c) 24 (d) 72

(24) A particle started its motion with velocity 126 km./hr. , it stopped after covering a distance 122.5 metres , then the acceleration of motion of the particle = ... m./sec^2

(a) – 5 (b) 5 (c) $\frac{324}{5}$ (d) $\frac{-324}{5}$

(25) A car moves in a straight line , when its velocity was 72 km./hr. it used brakes , it moved with constant retardation till its velocity became 54 km./hr. after a distance of 140 metres , then the acceleration = ... m./sec^2

(a) $-\frac{1}{2}$ (b) $-\frac{3}{4}$ (c) $\frac{-5}{8}$ (d) – 1.4

(26) A car moved from rest with acceleration of magnitude 4 m. /sec.^{2} , then the distance that the car covered till its speed becomes 24 m. /sec. is ..... m.

(a) 72 (b) 35 (c) 96 (d) 81

(27) A train moves in a straight line with speed 45 km./hr. When it came near the station , it used brakes to move with retardation of magnitude $1\frac{1}{4}$ m./sec.^{2} till it stopped in the station , then the distance covered by the train from the moment of using brakes till it stopped = ... m.

(a) 78.25 (b) 62.5 (c) 92 (d) $9\sqrt{10}$

(28) A racing car moves on the track with speed 44 m. /sec. in a certain moment then its speed decreases with a constant rate until it becomes 22 m. /sec. in 11 seconds , then the distance that the car covered within this time = ... m.

(a) 238 (b) 415 (c) 363 (d) 348

(29) The average velocity of a particle moving with initial velocity (v_o) and a uniform acceleration (a) within the 6th second from the beginning of motion = ...

(a) $v_o + 5\,a$ (b) $v_o + 6\,a$ (c) $v_o + 5\frac{1}{2}\,a$ (d) $v_o + 3\,a$

(30) The average velocity of a particle moving with initial velocity (v_o) and a uniform acceleration (a) within (7th , 8th and 9th) seconds from the beginning of motion = ...

(a) $v_o + 7\frac{1}{2}\,a$ (b) $v_o + 8\,a$ (c) $v_o + 8\frac{1}{2}\,a$ (d) $v_o + 9\,a$

(31) A body starts its motion in a constant direction with initial velocity 15 cm./sec. and uniform acceleration of magnitude 4 cm./sec.^{2} in the same direction of its initial velocity , then the covered distance during the 6th second only = ... cm.

(a) 32 (b) 35 (c) 39 (d) 37

(32) A particle starts its motion in a straight line with initial velocity 5 m./sec. and uniform acceleration 2 m./sec.^{2} in the same direction of its initial velocity , then the covered distance during 6th , 7th and 8th seconds only = ... m.

(a) 18 (b) 54 (c) 36 (d) 57

(33) A body starts its motion in a constant direction with a velocity 10 cm./sec. and uniform acceleration 5 cm./sec.^{2} in the same direction as its velocity , then the distance covered in the seventh and the eighth seconds only = ... cm.

(a) 54 (b) 45 (c) 60 (d) 90

(34) A car driver used the break to be stopped during 15 second at which he covered a distance 30 m. , then the car speed at the starting of using the break = ... m./sec.

(a) 15 (b) 8 (c) 4 (d) 6

(35) A particle started its motion in constant direction with velocity 20 cm./sec. and a uniform acceleration of magnitude 2 cm./sec^2 in the opposite direction of the initial velocity , then the time elapsed from starting motion till its velocity becomes 3.6 km./hr. in the opposite direction of starting motion's direction = ... minutes.

(a) 60 (b) 35 (c) 1 (d) 6

(36) A particle moves in a straight line with a uniform acceleration of magnitude $\frac{1}{2}$ m./sec^2. Its velocity becomes $31\frac{1}{2}$ km./hr. in the same direction of its acceleration after 12 seconds from starting motion , then its initial velocity = ... m./sec.

(a) 2.75 (b) 3 (c) 2.25 (d) 1.6

(37) A particle moves in a straight line. Its velocity became 100 cm./sec. after 5 seconds from starting motion , and became 72 cm./sec. in the same direction after 12 seconds from starting motion , then its initial velocity = ... cm./sec.

(a) – 4 (b) 86 (c) 120 (d) 172

(38) A body moves in a straight line with uniform acceleration. It covered 52 metres in the first four seconds , then it covered a distance 92 metres in the next four seconds. , then the acceleration of motion = ... m./sec^2

(a) – 2.5 (b) 3 (c) 3.5 (d) 2.5

(39) A bullet is fired out with a velocity 50 m./sec. on a fixed target. it comes at rest after it embedded a distance 25 cm. , then the velocity with which the bullet comes out of the same target if its thickness is 16 cm. , considering that the acceleration did not change in the two cases equals ..... m./sec.

(a) 30 (b) 35 (c) 25 (d) 40

(40) A car started its motion from rest with uniform acceleration from a point A to pass by a radar at point B with speed 60 km./hr. , then it passed by another radar at point C with speed 120 km./hr. if BC = 6 km. , then AB = ... km.

(a) 6 (b) 8 (c) 3 (d) 2

(41) If a particle moves with initial speed (v_o) , final speed is (v) , such that : $\frac{v}{v_o} + \frac{v_o}{v} = 2$, then .....

(a) $a > 0$ (b) $a < 0$ (c) $a = 0$ (d) $1 < a \leq 2$

(42) A body moves with initial velocity (v_o) cm./sec. and uniform acceleration (a) cm./sec^2. and final velocity (v) cm./sec. and $v - v_o = 10$ cm./sec. , $\sqrt{a\,s} = 20$ cm./sec. , then $\frac{v}{v_o} =$ .....

(a) $\frac{17}{9}$ (b) $\frac{5}{4}$ (c) $\frac{9}{7}$ (d) $\frac{9}{5}$

(43) A bicyclist moved with uniform acceleration $\frac{1}{4}$ m./sec^2. in a straight road of length 100 m. , if its speed at the end of the road is greater than its speed at the start of the road by 2 m./sec. , then its speed at the end of the road = ... m./sec.

(a) 11.5 (b) 12.5 (c) 13 (d) 13.5

(44) A particle moved in a constant direction with an initial velocity and a uniform acceleration. If the particle covered within the 3rd second only a distance 20 metres , then it covered a distance 60 metres within the two seconds 5th and 6th , then the acceleration of motion = ... m./sec^2.

(a) 4 (b) 10 (c) 3 (d) 5

(45) A particle started its motion with initial velocity v_o cm./sec. and acceleration (a) cm./sec^2. in the same direction of its initial velocity till its velocity became $(100 - v_o)$ cm./sec. after it covered a distance 10 m. , then the elapsed time = ... sec.

(a) 10 (b) 20 (c) 15 (d) 30

(46) A body moves in a straight line with uniform acceleration. It moves 10 m. in the 1st second and 15 m. in the 2nd second , then the distance covered during the 3rd second = ... m.

(a) 20 (b) 25 (c) 30 (d) 45

(47) A car starts its motion from rest at (A) and moves in a straight line with uniform acceleration for 20 second till it reaches to point (B). If the speed of the car at (B) is 30 m./sec. , then the speed of the car at point (C) $\simeq$ ..... m./sec. where C lies between A and B where AC = 40 m.

(a) 10 (b) 11 (c) 13 (d) 15

(48) A competitor moves with uniform acceleration passes through three collinear points A , B and C where AB = BC = 20 m. If the speed of the competitor at A equals 8 m./sec. and at B equals 12 m./sec. , then its speed at C is ..... m./sec.

(a) 16 (b) 20 (c) $14\sqrt{2}$ (d) $4\sqrt{14}$

(49) Two bodies move on the same horizontal line in opposite directions. If the first body moves from point A with initial speed 8 m./sec. and acceleration $\frac{3}{4}$ m./sec^2 and the second body moves from point B with initial speed 4 m./sec. and acceleration $\frac{5}{4}$ m./sec^2 If AB = 64 m. , then the two bodies collide after ..... sec.

(a) 2 (b) 4 (c) 6 (d) 8

(50) A car (A) moved with uniform speed 15 m./sec. at the same instant another car (B) is moving from the same point from rest with acceleration 3 m./sec^2 in the same direction as car A , then the car B to overtake car A after ..... seconds.

(a) 5 (b) $\sqrt{3}$ (c) 15 (d) 10

(51) An engineer is designing the runway for an airport for the planes that will use it , the lowest acceleration rate is likely to be 3 m./sec^2. The take off speed for the planes will be 65 m./sec. then the minimum allowed length for the runway = ... m.

(a) $704\frac{1}{6}$ (b) $810\frac{5}{6}$ (c) $406\frac{1}{4}$ (d) $754\frac{1}{6}$

(52) A ball is projected horizontally in opposite direction of winds with initial speed v_o = 15 cm./sec. it moved with uniform deceleration 5 cm./sec^2 , then the total distance that the ball corverd in 5 sec. is .....

(a) 22.5 (b) 10 (c) 32.5 (d) 12.5

(53) A bus is moving in a straight road between two stations , the distance between them is 1 km. if it begins motion at rest from the first station with uniform acceleration of magnitude 1.5 m./sec^2 till its speed becomes 15 m./sec. , then it moves by this velocity for a distance , then it moves with uniform deceleration of magnitude 1 m./sec^2. to stop in the next station , then the covered distance with uniform velocity = ... m.

(a) 711.5 (b) 713.5 (c) 187.5 (d) 812.5

(54) If the velocity of a moving car (A) in a straight line changes from 24 km./hr. to 36 km./hr. within 5 seconds , the velocity of another car (B) moving in the same straight line and the same direction changes from 12 km./hr. to 30 km./hr. within the same time interval , then .....

(a) the two cars A and B are moving with the same magnitude of acceleration.

(b) the two cars will move with the same velocity after another 5 seconds.

(c) car A is moving with acceleration greater than that of car B

(d) speed of car B will be twice speed of car A after 7 seconds from starting observation.

(55) A car is moving with uniform velocity 72 km./hr. , the driver observed a traffic light at 50 m. ahead turned to the red light if the time taken to press down the brakes is 0.5 second , and after he pressed down the brake the car decelerate uniformaly by 4 m./sec^2. , then .....

(a) the car just stopped at the traffic light.

(b) the car stopped before the traffic light by a distance 2 m.

(c) the car stopped after the traffic light by a distance 10 m.

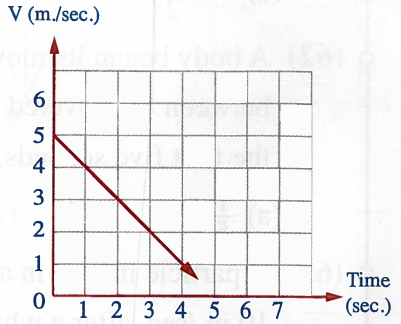
(d) the car stopped after the traffic light by a distance 5 m.

(56) In the opposite figure :

The acceleration (a) = ... m./sec.^{2}

(a) 2 (b) – 2

(c) – 3 (d) – 1



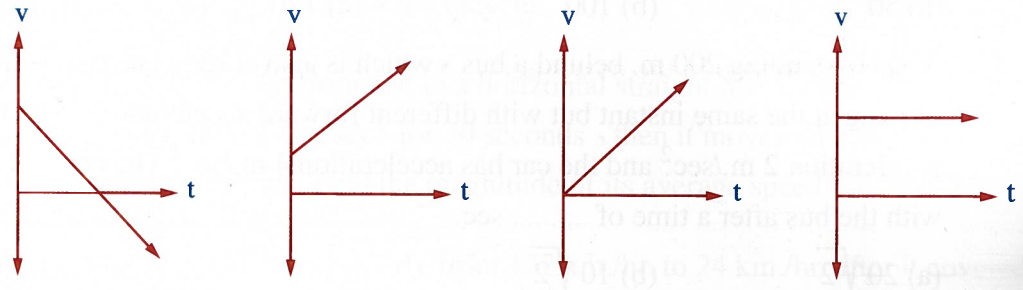
(57) The dots of oil fall from one of the cars moving from the left to the right as the figure :

By observing these dots then the car moves with :

(a) uniform motion. (b) acceleration.

(c) retardation. (d) retardation , then a uniform velocity.

(58) Which of the following (velocity-time) graphs represents a body motion such that $v_o > 0$, $a < 0$?



(a) (b) (c) (d)

(59) A body moves in the positive direction of X-axis with acceleration 2 m./sec^2. , that means .....

(a) the body moves 2 m. every second.

(b) the body moves with speed 2 m./sec.

(c) the speed of the body decreases at rate 2 m./sec. every second.

(d) the speed of the body increases at rate 2 m./sec. every second.

(60) The distance between A and B is 50 m. If a body moves from A towards B from rest with an acceleration 2 m./sec.^{2} and after it covered half of the distance , the acceleration was ceased , then the time of the journey from A to B equals ..... seconds.

(a) 2.5 (b) 5 (c) 7.5 (d) 10

(61) A body began its motion from rest with a uniform acceleration (a). It reached velocity (v) after (t) seconds , then the displacement of the body during the last second equals .....

(a) $v + \frac{1}{2} a$ (b) $v - \frac{1}{2} a$ (c) $v^2 - 2a$ (d) $\frac{v^2}{2a}$

(62) A body began its motion from rest with a uniform acceleration , then the ratio between the covered distance during the fifth second to the covered distance during the first five seconds = ...

(a) $\frac{1}{5}$ (b) $\frac{9}{25}$ (c) $\frac{9}{16}$ (d) $\frac{16}{25}$

(63) A particle moves in a straight line with a uniform acceleration with initial velocity 10 m./sec. after a while its velocity becomes 30 m./sec. , then its velocity at the middle covered distance equals ..... m./sec.

(a) 10 (b) $10\sqrt{3}$ (c) $10\sqrt{5}$ (d) $5\sqrt{10}$

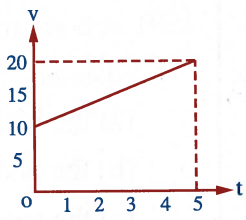
(64) A car moves with speed 40 km./hr. and when the driver applied the brakes the car stops in 40 m. If the same car was moving with speed 80 km./hr. , then the distance the car needs to stop when applying the brakes is ..... m. given that the deceleration in both cases is the same.

(a) 50 (b) 100 (c) 120 (d) 160

(65) A car is standing 200 m. behind a bus , which is also at rest. The two vehicles start moving at the same instant but with different forward accelerations. The bus has acceleration 2 m./sec.^{2} and the car has acceleration 4 m./sec.^{2} The car will catch up with the bus after a time of ..... sec.

(a) $20\sqrt{2}$ (b) $10\sqrt{2}$ (c) $10\sqrt{3}$ (d) 15

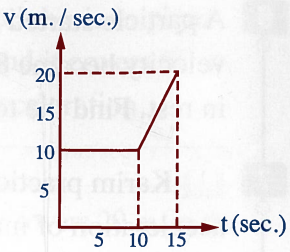
(66) The given figure represents the relation between the velocity (m./sec.)-time (t sec.) for a body moving in a straight line for 5 seconds , then the displacement covered in this time interval is .....



(a) 25 metres. (b) 50 metres.

(c) 75 metres. (d) 100 metres.

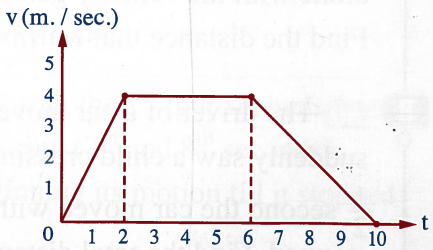
(67) The opposite figure represents the velocity-time graph of a car moving in a straight line , then the covered distance during the first 15 seconds equals ..... m.



(a) 100 (b) 150

(c) 175 (d) 225

(68) The given figure represents a curve of (velocity – time) for a particle moves in a straight line from the origin point , then the distance covered by the particle from the origin point after 2 sec. from starting motion = ... m.



(a) 20 (b) 16

(c) 8 (d) 4

Second Essay questions

1 A particle started its motion in a constant direction with velocity 54 km./hr. , then it stopped after 5 seconds , find :

(1) The acceleration of the particle.

(2) The covered distance during this period. « -3 m./sec^2 , 37.5 metres »

---

2 A cyclist moves with uniform acceleration till its velocity becomes 7.5 m./sec. within 4.5 seconds. If the displacement of the bicycle within the period of acceleration equals 19 metres. Find the initial velocity of the bicycle. « $\frac{17}{18}$ m./sec. »

---

3 A body started its motion from rest in a horizontal straight line with uniform acceleration of magnitude 4 cm./sec^2 for 30 seconds , then it moves with the velocity it gained for another 40 seconds. Find the magnitude of its average speed. « $94\frac{2}{7}$ cm./sec. »

---

4 The velocity of a car decreases regularly from 132 km./hr. to 24 km./hr. after it covered a distance 1170 metres. Find the time taken to cover this distance , then what is the covered distance afterwards till it becomes at rest ? « 54 seconds , 40 metres »

---

5 A cyclist descended from rest from the top of a hill with constant acceleration of magnitude 2 m./sec^2 , when he came to the base of the hill , its velocity became 18 m./sec. , then he moved with this velocity for one minute.
Find the total distance covered by the cyclist. « 1161 metres »

6 A particle started its motion from rest with uniform acceleration 20 cm./sec.^{2} When its velocity became 8 m./sec. it moves with uniform retardation 25 cm./sec.^{2} till it becomes in rest. Find the total time and the covered distance.

« 72 sec. , 288 metres »

---

7 Karim practices on riding the bicycle. His father pushes him to gain a constant acceleration of magnitude $\frac{1}{2}$ m./sec.^{2} for 6 seconds and after that Karim rides the bicycle alone with the velocity gained for another 6 seconds before he falls on the ground. Find the distance that Karim will cover.

« 27 metres »

---

8 The driver of a car moves with constant velocity of magnitude 24 m./sec. he suddenly saw a child crossing the street. If the time required for the brake to respond is $\frac{1}{2}$ second the car moved with uniform deceleration of magnitude 9.6 m./sec.^{2} till it stopped. Find the total distance covered by the car from the instant of observing the child and before it stopped justly.

« 42 metres »

---

9 A particle starts its motion with velocity 60 cm./sec. in a straight line from a fixed point (O) and with uniform retardation 7.5 cm./sec.^{2} Find when the particle becomes at a distance 105 cm. from (O) in the same side to which the particle started its motion and when is the particle at a distance 300 cm. from the point (O) in the other side of it.

« 2 , 14 seconds. 20 seconds »

---

10 A small ball moved with velocity 150 cm./sec. on a horizontal plane in a straight line with uniform retardation of magnitude 15 cm./sec.^{2} . Find the time passed from starting motion till it became at a distance 720 cm. from the point of starting motion.

« 8 , 12 , 24 seconds »

---

11 A small ball has been projected horizontally in the opposite direction of winds with velocity 45 cm./sec. to move in a straight line with retardation of magnitude 6 cm./sec.^{2}

(1) When does the ball return back to the start point of projecting ?

(2) When will the ball be at distance 162 cm. from the point of projecting ?

« 15 seconds , 6 , 9 , 18 seconds »

---

12 A particle is projected in the opposite direction of the wind with velocity 40 cm./sec. , so it moves a deceleration motion in a straight line with uniform acceleration of magnitude 8 cm./sec.^{2} **Find the velocity of the particle when it was at a distance :**

(1) 84 cm. form the point of projection and in the same direction of projection.

(2) 96 cm. from the point of projection and in the opposite direction of projection.

(Explicate the meaning of the results you obtained).

« 16 cm./sec. in the direction of projection , 16 cm/sec. in the direction of the other side of projection , 56 cm./sec. in the opposite direction of projection »

13 A body moves in a straight line with uniform acceleration on a smooth horizon plane it covers 26 metres within the 4^{th} second from starting its motion , and it covers 56 m. within 9^{th} second. Find its initial velocity and the magnitude of its acceleration.

« 5 m./sec. , 6 m./sec.^{2} »

---

14 A body moves in constant direction with constant acceleration , if the body covers 20 m. in the third second from the beginning of motion and 150 m. during the eighth , ninth and tenth seconds. Find the magnitude of the acceleration and its initial velocity. « 5 m./sec.^{2} , 7.5 m./sec. »

---

15 A particle moves with uniform acceleration. , it covered during the 1^{st} four seconds from its motion a distance 200 m. , then it covered 50 metres during (7^{th} and 8^{th} seconds). Find its initial velocity and the distance covered since beginning its motion till it stopped.

« 60 m./sec. , 360 m. »

---

16 A body started its motion with velocity 7 m./sec. and with uniform acceleration 2 m./sec.^{2} , it covered a distance 30 metres , then the acceleration stopped to move afterwards with uniform velocity a distance 52 metres. **Find :**

(1) The total time of motion.

(2) The covered distance in the 3^{rd} second only. « 7 seconds , 12 m. »

---

17 A body started its motion from rest in a straight line with uniform acceleration 0.36 km./hr./sec. when its velocity became 8 m./sec. , it moved with uniform retardation till it became at rest after 112 seconds from starting motion. calculate the magnitude of the uniform retardation and the total distance. « $\frac{1}{4}$ m./sec.^{2} , 448 metres »

---

18 A body started its motion from rest to cover 150 m. and when its velocity became 54 km./hr. the acceleration stopped and it moved with its acquired velocity a distance of 300 m. , then it moved with a uniform deceleration of value $\frac{3}{2}$ m./sec.^{2} till it stopped. Calculate the average speed during the whole trip. « 10.5 metre/second »

---

19 A car moved from rest in a straight line with uniform acceleration 3 m./sec.^{2} , at the moment at which the velocity became 118.8 km./hr. , its driver saw a child crossing the street. he used the brakes to stop after covering a distance 24.75 m. Find the total distance covered by the car and the total time of motion.

« 206.25 metres , 12.5 seconds »

---

20 A particle moved from rest in a constant direction with uniform acceleration. At the end of 400 m. the velocity was 10 m./sec. , then it moved with this velocity for a distance 800 m. , then it moved with retardation of a uniform acceleration , to cover a distance 200 m. till it became at rest. Find the elapsed time in covering the total distance and find also the average speed during the motion.

« 200 seconds , 7 m./sec. »

21 A bullet was fired with velocity 200 m./sec. in perpendicular direction on a vertical wall with a thickness of 14 cm. So , it went out with velocity 150 m./sec. Find the magnitude of the deceleration , and if the bullet was fired with the same velocity on another identical vertical wall with the same resistance. So , find the distance that it embedded until it rests , if it is known that the acceleration that the bullet moves with it is the same in both cases.

« 62500 m./sec.^{2} , 32 cm. »

22 A body moves on a straight line. It covers 52 cm. in 4 sec. with uniform acceleration , then the acceleration is ceased for 3 sec. during which it covers 48 cm. after which it moves by a deceleration equals twice its acceleration until it stopped. Find the initial velocity and the total distance covered by the body.

« 10 cm./sec. , $142\frac{2}{3}$ cm. »

23 A particle is moving in a straight line from rest. It covered a distance 125 metres with uniform acceleration 10 m./sec.^{2} , then the acceleration is ceased , then it moved with the velocity which it gained another distance of 400 metres. , then it moved with retardation of a uniform acceleration 5 m./sec.^{2} till it came to rest. Find the time taken in covering the whole distance.

« 23 seconds »

24 A body moves in a straight line with a uniform acceleration 3 m./sec.^{2} After covering 150 metres , the acceleration was ceased. So it moves with the velocity acquired at the end of this distance for 20 seconds. If the total distance covered by the body is 1150 metres , then find its initial velocity.

« 40 m./sec. »

25 A car started its motion from rest with uniform acceleration 180 km./hr. every minute. After 24 seconds , the acceleration is ceased and the velocity decreased uniformly by means of friction and air resistance at a rate of 450 m./hr./sec. and after 32 seconds the brakes are used to stop it in 8 seconds. Find the distance covered by the car.

« 880 metres »

26 A small ball is moving in a straight line with uniform velocity 12 cm./sec. , and after 4 seconds from its passing by a certain point , another ball moved from this point in the same direction of the first ball with initial velocity 4 cm./sec. and with uniform acceleration 2 cm./sec.^{2}. Find when and where the two balls impact and what is the velocity of the second ball before impact directly.

« 12 seconds from the motion of the 2nd ball , 192 cm. , 28 cm./sec. »

27 A lift is at rest at the bottom of a mine. The lift rises a distance 540 cm. with acceleration of magnitude 120 cm./sec.^{2} then it moves with uniform velocity for a distance 360 cm. , then with a uniform deceleration a distance 720 cm. until it rests at the nozzle of the mine. Calculate the time that the lift takes in ascending from the bottom of the mine to its nozzle.

« 8 seconds »

28 A train moves in a straight line between two stations of 5280 metres apart. If it starts from rest from any of the two stations and moves with a uniform acceleration of 2.2 m./sec.^{2} until its velocity becomes 44 m./sec. , then it moves with this velocity for a while , then it moves with a uniform retardation of 1.1 m./sec.^{2} until it stops in the other station. Find the time taken in moving between the two stations. « 2.5 minutes »

---

29 A train moves in a straight line between two stations from rest with a uniform acceleration (a) m./sec.^{2} for one minute , then it moves with the velocity it acquires for 2 minutes , then it moves with a uniform retardation (2 a) m./sec.^{2} until it comes to rest. Find the ratio among the three distances it covered , and if the distance between the two stations is 9.9 km. Find the magnitude of (a) and the uniform velocity it moves with. « 2 : 8 : 1 , 1 m./sec.^{2} , 60 m./sec. »

---

30 A particle was moving with uniform acceleration (a) m./sec.^{2} It covered 400 cm. in 10 seconds. then it increased the acceleration to (2 a) m./sec.^{2}, so it covered another 700 cm.in 10 seconds , then it moved with retardation (3 a) m./sec.^{2} until it came to rest. Evaluate (a) and the total distance covered by the particle. « 2 cm./sec.^{2} , 1775 cm. »

---

31 X and Y are two points on a horizontal straight line. A car (A) started its motion from X towards Y from rest with a uniform acceleration 10 m./sec.^{2} at the same moment another car (B) moved from Y towards X with uniform velocity of magnitude 54 km./hr. If the relative velocity of the car (A) with respect to (B) at the moment of meeting equals 162 km./hr. Find the time taken by each of the two cars from the moment of starting motion till they meet together. « 3 seconds »

---

32 A small ball has been projected against the direction of the wind with horizontal velocity of magnitude 9 m./sec. , then it moved in a straight line with retardation of a uniform acceleration of magnitude 1.8 m./sec.^{2}

Find :

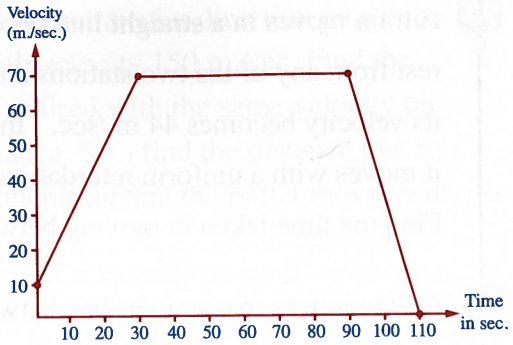
(1) The displacement of the ball when it came to rest instant.

(2) The distance covered by the ball from the beginning of motion till it returns back to the point of projection.

(3) The displacement of the ball after 8 seconds from the beginning of motion and the distance which the ball covered at this moment.

(4) The velocity of the ball when it is at a distance 40 m. in the side opposite to the side where the motion began. « 22.5 m. , 45 m. , 30.6 m. , 15 m./sec. in the opposite direction »

33 The opposite figure represents the curve between (velocity and time) of a body started his motion with initial velocity 10 m./sec. till it became at rest after 110 seconds.



Find :

(1) The acceleration.

(2) The magnitude of the uniform deceleration of the body till it became at rest.

(3) The total distance that the body covered.

« 2 m./sec.^{2} , 3.5 m/sec.^{2} , 6100 metres »

Third Higher skills

1 **Choose the correct answer from those given :**

(1) Which of the following is impossible to happen to a body moving in a straight line ?

(a) to have velocity towards east and acceleration towards west.

(b) to have velocity towards east and acceleration towards east.

(c) to have constant acceleration and variable velocity.

(d) to have constant non-zero velocity and variable acceleration.

(2) A body moves from rest with uniform acceleration for 20 sec. If it covers distance (s_1) in the first 10 seconds and (s_2) in the next 10 seconds then .....

(a) $s_2 = s_1$ (b) $s_2 = 2\ s_1$ (c) $s_2 = 3\ s_1$ (d) $s_2 = 4\ s_1$

(3) A train starts its motion from rest at a station with acceleration 1 m./sec.^{2} at the same moment a man was moving with uniform speed 10 m./sec. behind the train and in the same direction as the train far from the last door in the train 50 m. , then the time needed for the man to catch up the train = ... sec.

(a) 5 (b) 10 (c) 15 (d) 20

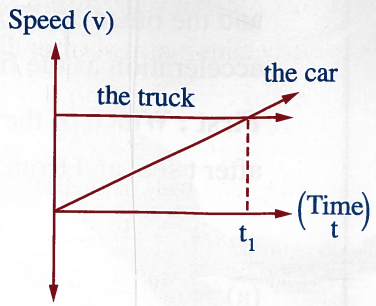
(4) A moving train with uniform acceleration , if its front passes a fixed point with speed (v_1) and its tail end passes the same point with speed (v_2) , then the midpoint of the train passes this point with speed .....

(a) $\frac{v_1 + v_2}{2}$ (b) $\frac{v_1^2 + v_2^2}{2}$ (c) $\sqrt{v_1 + v_2}$ (d) $\sqrt{\frac{v_1^2 + v_2^2}{2}}$

(5) A body starts its motion in a straight line with initial speed 7 cm./sec. and with uniform acceleration 4 cm./sec.^{2} to cover distance 30 cm. , then the acceleration is ceased and the body moved with uniform speed to cover 34 cm. , then the distance covered in the third second only is ..... cm.

(a) 16.5 (b) 17 (c) 17.5 (d) 18

(6) The given (speed-time) graph represents the motion of both car and truck which are moving from the same place and in a straight line. Which of the following is true for the covered distance till time (t_1) .....



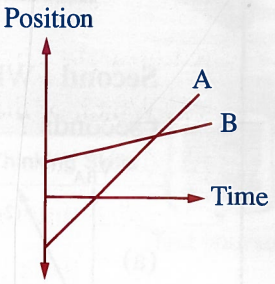
(a) They have same covered distance.

(b) The truck does not move.

(c) The car covers more distance than the truck.

(d) The truck covers more distance than the car.

(7) The opposite figure represents the (position-time) graph of two bodies A and B. Which of the following is true ?



(a) Each of A and B moves with uniform equal speed.

(b) A accelerates but B decelerates.

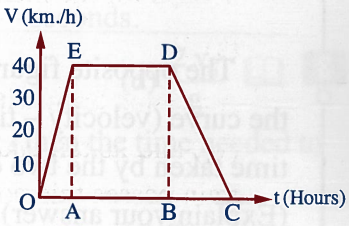
(c) Each of A and B moves with uniform speed and the speed of A is more than the speed of B

(d) Each of A and B moves with uniform speed and the speed of B is more than the speed of A

(8) A and B are two bodies , they are moving in the positive direction of the $\mathcal{X}$-axis and they are 40 m. apart , A behind B. If A moves with initial speed 12 m./sec. and acceleration 4 m./sec.^{2} and B moves with initial speed 4 m./sec. and acceleration 12 m./sec.^{2} , then the least distance between the two bodies = ... m.

(a) 30 (b) 32 (c) 36 (d) 40

(9) The opposite figure represents the velocity-time graph of a car moving in a straight line from rest.



If OA : AB : BC = 1 : 3 : 2 , then the average velocity of the car during the whole journey = ... km./h.

(a) 30 (b) 32

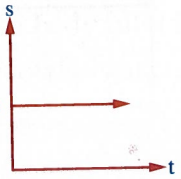
(c) 36 (d) 40

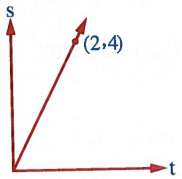
(10) If a bullet loses $\frac{1}{10}$ of its velocity passing through a plank , then the least number of planks required to stop the bullet is ..... (retardation is the same across the different plants).

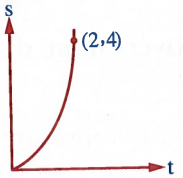
(a) 5 (b) 6 (c) 7 (d) 8

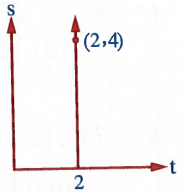
(11) Two cars A , B moving in the same direction from the same point and at the same time. The first car (A) began its motion with velocity 4 m./sec. and acceleration (a) m./sec.^{2} and the other car (B) began its motion with velocity 6 m./sec. with the same acceleration as the first car (a) m./sec.^{2}

First : Which of the following figures illustrates the distance between the two cars after t sec. and from the beginning of motion ?

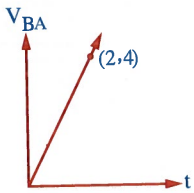
(a) 

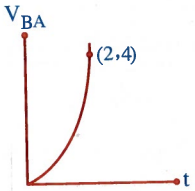
(b) 

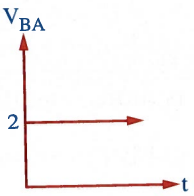
(c) 

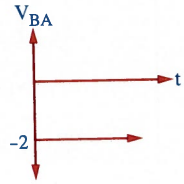
(d) 

Second : Which of the following figures illustrates the algebraic measure of $\overrightarrow{v}_{BA}$ after t seconds ?

(a) 

(b) 

(c) 

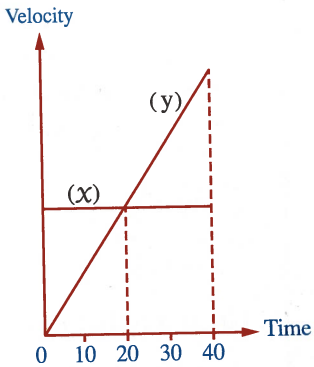
(d) 

2 A car is moving with uniform velocity 54 km./hr. passed by a police car at rest , the police car started motion following it after 30 seconds with uniform motion acceleration to cover a distance 200 metre till its velocity became 72 km./hr. , then it moved with this velocity until it reached the first car. Find the time taken during the chasing process from the moment of motion of the police car and the distance covered by the police car.

« 130 second , 2400 m. »

3 The opposite figure represents the curve (velocity – time) for two cars $\mathcal{X}$ and y find the time taken by the two cars till they met.
(Explain your answer).

« 40 seconds »



Exercise

3

Vertical motion under the effect of gravity (Free fall)

From the school book

Remember · Understand · Apply · Higher Order Thinking Skills

Test yourself

First Multiple choice questions

Choose the correct answer from those given :

(1) If a body fell vertically downwards , then .....

(a) $v = v_o$ (b) v = zero (c) $v_o = 0$ (d) $s = vt$

(2) When the body reaches its maximum height , then ..... = zero

(a) s (b) v (c) v_o (d) a

(3) If the body projected upward is returned to the point of projection , then .....

(a) $|v| = |v_o|$ (b) $s = 0$ (c) $a = 0$ (d) a and b

(4) If a body is projected up with speed (v_o) m./sec. to reach its maximum height (s) m. the time needed to reach the maximum height equals ..... seconds.

(a) $\frac{v_o}{2g}$ (b) $\frac{v_o}{g}$ (c) $\frac{v_o^2}{2g}$ (d) $\frac{2\,v_o}{g}$

(5) A body is projected vertically up with velocity 98 m./sec. , then the time needed to reach maximum height = ... sec.

(a) 15 (b) 10 (c) 3 (d) 20

(6) A body is projected vertically upwards with velocity 42 m./sec. , then the maximum height which the body reaches equals .....

(a) 65 m. (b) 98 m. (c) 84 m. (d) 90 m.

(7) A body is projected vertically upward from a point on the ground surface , if the maximum height the body reached is 44.1 m. , then the velocity of projection = ... m./sec.

(a) 44.1 (b) 22.05 (c) 19.6 (d) 29.4

(8) A body is projected vertically upward to cover a distance 88.2 m. till it returned to the projection point , then the taken time = ... sec.

(a) 4 (b) 6 (c) 5.5 (d) 3

(9) If a body is projected vertically up with speed 24.5 m./sec. , then it returns back to the point of projection after ..... seconds.

(a) 2.5 (b) 5 (c) 10 (d) zero

(10) If a body is projected vertically up from the ground surface and it returns back to the point of projection after 12 seconds , then the falling time = ... seconds.

(a) zero (b) 3 (c) 6 (d) 12

(11) If a body is projected vertically up from a point on the ground surface and it returns back to the same point after 10 seconds , then its maximum height the body can reached = ... m.

(a) 122.5 (b) 245 (c) 49 (d) 490

(12) If a bullet fired vertically up from a point on the ground surface and returned to the projection point after 10 seconds , then the initial speed of the bullet = ... m./sec.

(a) 9.8 (b) 49 (c) 25 (d) 98

(13) A body is projected vertically upward with velocity 7 m./sec. , then the covered distance till it returned to the projection point = ... m.

(a) zero (b) 5 (c) 7.5 (d) 10

(14) If a body fell from a height 10 m. above a horizontal ground , then its velocity when it collide with the ground measured by m./sec. is .....

(a) 0 (b) 20 (c) 14 (d) 196

(15) A body is projected vertically down with velocity 15 m./sec. from a height 100 m. , then its velocity after 3 seconds = ... m./sec.

(a) 46.7 (b) 29.4 (c) 44.4 (d) 32.8

(16) A body fell down from the edge of an empty well to reach its bottom after 2 seconds , then the depth of the well = ... m.

(a) 78.4 (b) 19.6 (c) 11.025 (d) 17.2

(17) A ball fell vertically downward from the top of a tower of height 122.5 m. , then the elapsed time to reach ground surface = ... sec.

(a) 4 (b) 7 (c) 6 (d) 5

(18) A body is projected vertically downward with velocity 20.6 m./sec. from the top of a tower of height 105.9 m. , then the velocity of the body when it reached the ground surface = ... m./sec.

(a) 35 (b) 50 (c) 38 (d) 29.4

(19) A body is projected vertically downward with velocity 32 m./sec. , it reached the ground surface after 4 seconds , then the height from which the body is projected = ... m.

(a) 206.4 (b) 105.7 (c) 198.2 (d) 217

(20) A body fell down from the top of a tower of height 32.4 m. , then its velocity at a height 9.9 m. from the ground surface = ... m./sec.

(a) 194.04 (b) $\frac{21\sqrt{11}}{5}$ (c) 21 (d) 441

(21) A body is projected vertically downward , it covered a distance 15.5 m. during the 1st second from the projection , then the velocity of projection = ... m./sec.

(a) 15.5 (b) 10.6 (c) 9.8 (d) 17.2

(22) A body fell vertically downward from a height 240.1 m. , then its velocity at the moment of half the needed time to reach the ground surface = ... m./sec.

(a) 34.3 (b) 45 (c) 49 (d) 32.8

(23) A body fell down from the top of a tower , then the covered distance during the 3rd. second only from its falling = ... m.

(a) 9.8 (b) 19.6 (c) 44.1 (d) 24.5

(24) A body is projected vertically upward with velocity 49 m./sec. , then the covered distance during the 4th second only from the moment of projection = ... m.

(a) 9.8 (b) 14.7 (c) 117.6 (d) 24.5

(25) From the top of a tower , a body is projected vertically upward with initial velocity 9.8 m./sec. , it reached the ground surface after 12 seconds , then the height of the tower = ... m.

(a) 490 (b) 588 (c) 498 (d) 534

(26) A stone is projected vertically upward with velocity 28 m./sec. from the ground surface , it fell on the top of a house after 4 second from the moment of projection , then the height of the house = ... m.

(a) 112 (b) 98 (c) 33.6 (d) 38.4

(27) A stone is projected vertically upward with velocity 19.6 m./sec. from a point on the ground surface at the bottom of a house of height 14.7 m. , then the taken time till the stone descends at the top of the house = ... sec.

(a) 3 (b) 2.5 (c) 1 (d) 2

(28) A body is projected vertically upward from the top of a building 32.4 m. high with a velocity of 24 m./sec. , then the elapsed time till it reaches the ground surface = ... sec.

(a) 4 (b) 8 (c) 5 (d) 6

(29) A body is projected vertically downward with velocity 10.3 m./sec. from a height 119.6 m. , then the covered distance during the last second before it collide the ground surface directly = ... m.

(a) 44.6 (b) 49.5 (c) 82 (d) 72.354

(30) From the top of a tower , a particle is projected vertically upwards , and seen in front of the point of projection when it was descending after 4 seconds from the moment of its projection , then it reached the ground surface after another 3 seconds , then the maximum height of the particle above the ground surface = ... m.

(a) 102.9 (b) 122.5 (c) 112.75 (d) 111.5

(31) A ball fell vertically from a height 90 m. above the ground to impinging with it , then it rebounds vertically upwards with velocity of magnitude equals half the magnitude of its velocity before it impinges the ground directly , then the maximum height the ball can reach = ... metre.

(a) 45 (b) 18 (c) 22.5 (d) 19.6

(32) A helicopter is moving vertically upward with uniform velocity 10 m./sec. , a parachutist fell vertically downward from it , then the initial velocity of the parachutist = ...

(a) zero (b) 10 m./sec. downward.

(c) 10 m./sec. upward. (d) 9.8 m./sec downward.

(33) A balloons moving vertically upward with velocity 24.5 m./sec. , a body fell down from it to reach ground surface after 8 seconds , then height of balloons at the moment of falling the body from the ground surface = ... m.

(a) 117.6 (b) 119.8 (c) 108.7 (d) 96.8

(34) A particle is projected vertically downward with speed 20 m./sec. from a plane moves vertically upward with speed 180 km./h. , then the initial speed of the particle is .....

(a) 160 m./sec. upward. (b) 30 m./sec. upward.

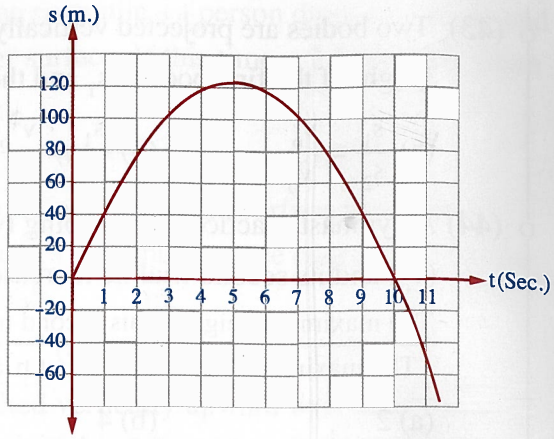
(c) 70 m./sec. upward. (d) 30 m./sec. downward.

(35) A man dropped a smooth ball inside a lift moving downward with uniform speed 50 cm./sec. , then the speed of the ball after $\frac{1}{2}$ second is .....

(a) 50 cm./sec. (b) 25 cm./sec.

(c) 54.9 cm./sec. (d) 5.4 m./sec.

(36) If a particle is projected upward and the opposite figure illustrates the relation between the displacement and time , then the initial velocity is ..... m./sec.



(a) zero

(b) 9.8

(c) 49

(d) 98

(37) A body is projected vertically upward , then the distance covered upwards in each second .....

(a) decreases by 4.9 m. (b) decreases by 9.8 m.

(c) increases by 9.8 m. (d) remains constant.

(38) If a body fell , then the distances covered during the first 3 seconds respectively is .....

(a) 9.8 m. , 9.8 m. , 9.8 m. (b) 4.9 m. , 14.7 m. , 24.5 m.

(c) 24.5 m. , 14.7 m. , 4.9 m. (d) 9.8 m. , 19.6 m. , 29.4 m.

(39) A body fell vertically downward. If v_1 , v_2 , v_3 are the velocities of the body at the end of the first , second and third seconds respectively , then $v_1 : v_2 : v_3$ = ...

(a) 1 : 1 : 1 (b) 1 : 2 : 3 (c) 1 : 2 : 4 (d) 3 : 2 : 1

(40) A body is projected vertically upward to cover a distance of s_1 in the 1^{st} second and s_2 in the 2^{nd} second and s_3 in the 3^{rd} second till it reaches its maximum height after 3 seconds , then .....

(a) $s_1 = s_2 = s_3$ (b) $s_1 < s_2 < s_3$ (c) $s_1 + s_3 = s_2$ (d) $s_1 + s_3 = 2\, s_2$

(41) A particle fell down from the top of a tower , it covered 19.6 m. during the last second of its falling , then height of the tower = ... m.

(a) 35 (b) $27\frac{3}{4}$ (c) $30\frac{5}{8}$ (d) $32\frac{5}{7}$

(42) If a body is projected vertically upward , then the covered distance during the last second just before it reaches its maximum height .....

(a) is constant. (b) depends on the initial velocity v_o

(c) depends on the body weight.

(d) depends on the maximum height of the body.

(43) Two bodies are projected vertically upward with velocities v_o , $\grave{v}_o$. The maximum height of the first body is s_1 and the maximum height of the second is s_2 , then .....

(a) $\frac{s_1}{s_2} = \frac{v_o}{\grave{v}_o}$ (b) $\frac{s_1}{s_2} = \frac{v_o^2}{\grave{v}_o^2}$ (c) $\frac{s_1^2}{s_2^2} = \frac{v_o}{\grave{v}_o}$ (d) $s_1 v_o = s_2 \grave{v}_o$

(44) A gymnast practices by jumping twice upward , in its first trial its initial speed was (v_o) and its second trial he increases his initial speed to ($4\ v_o$) , then :

$\frac{\text{The maximum height in his second trial}}{\text{The maximum height in his first trial}}$ = ...

(a) 2 (b) 4 (c) 8 (d) 16

(45) A ball fell from the top of a tower of height (s) metres. If the ball reaches the ground after (t) seconds , then the ball height after $\left(\frac{1}{3}\ t\right)$ second is ..... m. above the ground.

(a) $\frac{1}{9}$ s (b) $\frac{2}{9}$ s (c) $\frac{7}{9}$ s (d) $\frac{8}{9}$ s

(46) A body is projected vertically upwards with speed (v_o) to reach maximum height (s) , then to make the body reaches maximum height (3s) it should be projected by a speed .....

(a) $3\ v_o$ (b) v_o (c) $\sqrt{3}\ v_o$ (d) $9\ v_o$

(47) A body is projected vertically upward , it takes 3 seconds to reach its maximum height , then the time it takes to reach 39.2 m. above the point of projection = ... sec.

(a) 2 or 4 (b) 4 or 8 (c) 4 or 25 (d) 2 or 6

(48) If a body fell from a height (s_1) into sand and it travels a distance of (s_2) inside the sand , then the acceleration of the body inside the sand ..... the gravitational acceleration.

(a) > (b) ≥ (c) < (d) =

(49) If a body fell from a height 19.6 m. above a sandy ground to embed in it a distance 14 cm. till it rests , then the acceleration of the motion of the body inside the sand = ... m./sec^2.

(a) – 1372 (b) – 9.8 (c) 19.6 (d) 1732

(50) A kangaroo is capable of jumping to a height 2.5 m. , then the take off speed of the kangaroo = ... m./sec.

(a) 5.8 (b) 6.4 (c) 7 (d) 7.2

(51) If a basketball player can jump to height 1.29 m. , then the time he takes to return to the point of jumping ≃ ..... seconds.

(a) 0.5 (b) 1.03 (c) 1.35 (d) 2.7

(52) To evaluate the height of a bridge above the river nile , a person dropped a stone and measure the time it takes to reach the water surface. If this time = 2.5 seconds , then the height of the bridge ≃ ..... m.

(a) 42 (b) 33 (c) 31 (d) 29

(53) A body is projected vertically up from a point on the ground surface to cover a distance 16 m. up during the first n seconds , then the distance covered during the last n seconds while the body descends equals ..... m.

(a) 2 (b) 4 (c) 8 (d) 16

(54) From a point on the ground a ball is projected vertically upward with an initial speed. The ball crossed the same point twice , after 5 seconds and after 11 seconds from the beginning of projection then the maximum height of the ball = ... m.

(a) 78.4 (b) 313.6 (c) 627.2 (d) 1254.4

(55) A body is projected vertically upward with initial speed 39.2 m./sec. from the top of a building its height 80 m. , then the time interval for which the height of the body is more than the height of the building is ..... sec.

(a)] 4 , 8 [(b)] 0 , 4 [(c)] 0 , 8 [(d)] 2 , 8 [

Second Essay questions

1 A body is projected vertically downwards from the top of a tower of height 240 metres. It covered 15.5 metres during the 1st second. Find the time taken to reach the ground and its velocity.

« 6 sec. , 69.4 m./sec. »

---

2 A body is projected vertically upwards with velocity 39.2 m./sec.

Find :

(1) The time taken from the moment of its projection until it returns to the point of projection.

(2) The time it takes to be at height 34.3 metres from the point of projection.

(Explain the meaning of the two answers)

« 8 sec. , 1 sec. , 7 sec. »

---

3 From the top of a tower , a particle is projected vertically upwards with velocity 24.5 m./sec. It reached the ground surface after 8 seconds.

Find :

(1) The height of the tower

(2) The maximum height to which the particle reach above ground surface.

(3) The total distance covered by the particle within this time interval.

« 117.6 m. , 148.225 m. , 178.85 m. »

4 A body is projected upwards from a place , its height is 140 metres above the ground. It was found that it covered 10.5 metres in the third second during ascending only. **Find :**

(1) The projection velocity. **(2)** The maximum height the body reaches.

(3) The time it takes to reach the ground. « 35 m./sec. , 202.5 m. , 10 seconds »

---

5 A body is projected vertically upwards with velocity 19.6 m./sec. , from a point at a height 230.4 metres from the ground. **Find :**

(1) The maximum height of the body. « 250 metres »

(2) The position of the body after 5 seconds from its instant of projection.

« 24.5 metres down of the point of projection »

(3) The maximum velocity of the body. « 70 m./sec. downwards »

---

6 A body is projected vertically upwards with velocity 14 m./sec. from a point at height 350 metres , from the ground surface. **Find :**

(1) Time taken by the body to reach the ground surface.

(2) The total distance covered by the body till it reaches ground surface.

« 10 second , 370 metres »

---

7 A ball is projected vertically upwards from the top of a vertical tower with velocity 24.5 m./sec. **Find :**

(1) When does the ball reach the height 29.4 m. up the position of its projection ?

(2) When does the ball reach a distance 29.4 metres under the position of its projection ?

« 2 , 3 seconds , 6 seconds »

---

8 A particle is projected vertically upwards with velocity 24.5 m./sec. Determine the position of the particle and the direction of its motion after t seconds from the moment of its projection if (t) equals :

(1) 2 seconds. **(2)** 4 seconds.

(3) 5 seconds. **(4)** 6 seconds.

---

9 From the top of a hill of height 9.8 m. A body is projected vertically upwards with velocity 4.9 m./sec. **Find :**

(1) The velocity of the body at the moment of its reaching to the bottom of the hill.

(2) The time taken to reach the bottom of the hill. « 14.7 m./sec. downwards , 2 seconds »

10 A ball is projected vertically upwards from a window , then it reach to it again after 4 seconds from the moment of projection , then it reached the ground surface after 5 seconds from the moment of projection **Find :**

(1) The projection velocity.

(2) The maximum height the ball reached from the point of projection.

(3) The height of the window from the ground surface. « 19.6 m./sec. upwards , 19.6 m. , 24.5 m. »

---

11 A student practices on kicking football vertically upwards in air , then the ball returns due to the impact of every kick. So, it hits his foot. If the ball takes from the moment of its kicking until colliding with his foot 0.3 seconds.

(1) Find the initial velocity.

(2) The height that the ball reaches after the student kicked it.

« 1.47 m./sec. , 0.11025 metre »

---

12 A body fell down from the height (s) over the ground surface. If it covered in the last second of its motion 34.3 metres. **Find :**

(1) The velocity of the body at the moment of reaching the ground surface.

(2) The height at which the body fell down. « 39.2 m./sec. , 78.4 metres »

---

13 A body fell down from a height (h) . It covered in the last second $\left(\frac{9}{25}\ h\right)$ metres. **Find :**

(1) The height from which the body fell down.

(2) The velocity of the body at the moment of reaching the ground surface.

« 122.5 m. , 49 m./sec. »

---

14 A particle is projected vertically down from a point above the ground , so it imbedded on the ground a distance 14 cm. before it rests. If the particle moved inside the ground by uniform deceleration 63 m./sec^2. Find the height in which the particle fall. « 0.9 metre »

---

15 A body fell down from a height 22.5 metres on a sandy ground to imbedded on it a distance 25 cm. **Calculate each of :**

(1) The velocity of the body at the ground surface.

(2) The acceleration that the body moved with inside the ground.

« 21 m./sec. downwards , – 882 m./sec^2 »

---

16 A rubber ball fell downwards from a height 10 metres , it hit the ground and rebound vertically upwards a distance $2\frac{1}{2}$ metres, calculate the velocity of the ball before and after its hitting the ground directly. « 14 m./sec. downwards , 7 m./sec. upwards »

17 A ball fell vertically from a height 90 m. above the ground to impinging with it , then it rebounds vertically upwards with velocity of magnitude equals half the magnitude of its velocity before it impinges the ground directly. Find the maximum height the ball can reach.

« 22.5 metres »

18 From the top of a tower of height 196 m. over the surface of the ground. Two bodies are projected with the same velocity 14.7 m./sec. one vertically downwards and the other vertically upwards. What is the time elapsed by each of them to reach the ground surface ?

« 5 sec. , 8 sec. »

19 A body fell down from a height 40 metres over the ground surface. At the same moment and from a point on the ground surface , another body was projected vertically upwards with velocity 20 m./sec. The two bodies met together after an interval of time (t) **Find :**

(1) The value of (t)

(2) The covered distance by each of them.

« 2 sec. , 19.6 m. , 20.4 m. »

20 A body fell downwards from a height 60 metres over the ground surface. At the same moment another body is projected vertically upwards from the ground surface with velocity 20 m./sec. , the two bodies met after a time interval. Find this time , then find the distance covered by each of the two bodies within this interval , then mention if the two bodies at the moment of meeting where in opposite directions or in the same direction.

« 3 second , 44.1 metres , 24 $\frac{449}{490}$ metres in the same direction »

21 A body is at rest above the ground by 6.125 m. is pulled by a wire up with acceleration 2.45 m./sec.^{2}. After two seconds from the beginning , the wire is cut. **Find :**

(1) The speed of the body just before cutting the wire.

(2) The maximum height reached by the body above the ground.

(3) The velocity of the body when it reaches the ground. « 4.9 m./sec. , 12.25 m. , $4.9\sqrt{10}$ m./sec. »

22 A particle is projected vertically upwards with velocity 40 m./sec. from a point on the ground surface. After one second , another particle is projected from the same point and with the same vertical velocity of the first particle. After how many seconds and what is the height the two particles are meeting.

(consider the acceleration of gravity g = 10 m./sec.^{2})

« 4.5 seconds , 78.75 m. »

23 A balloon moves vertically with velocity 14.7 m./sec. A particle fell from it. It reached the ground surface after 4 seconds from the moment of its falling. Calculate the height of the balloon over the ground surface at the moment of falling the particle from it in each of the following cases :

(1) The balloon moves vertically downwards.

(2) The balloon moves vertically upwards.

« 137.2 m. , 19.6 m. »

24 A balloon moves vertically upwards with uniform velocity 24.5 m./sec. When it became at a height 245 metres above the ground surface , a particle fell from it. **Find :**

(1) The maximum height the particle will reach above the ground surface.

(2) The velocity with which the particle reach the ground surface.

(3) The time elapsed for reaching the ground surface.

(4) The height of the balloon at the moment at which the particle reached the ground.

« $275\frac{5}{8}$ m. , 73.5 m./sec. downwards , 10 seconds , 490 metres »

---

25 A balloon moves vertically upwards with uniform velocity 28 m./sec. A stone is projected from it downwards with velocity 12.5 m./sec. It reached the ground surface after 5 seconds from the moment of its projection.

Find :

(1) The height of the balloon over the ground surface at the moment of reaching of the stone to the ground.

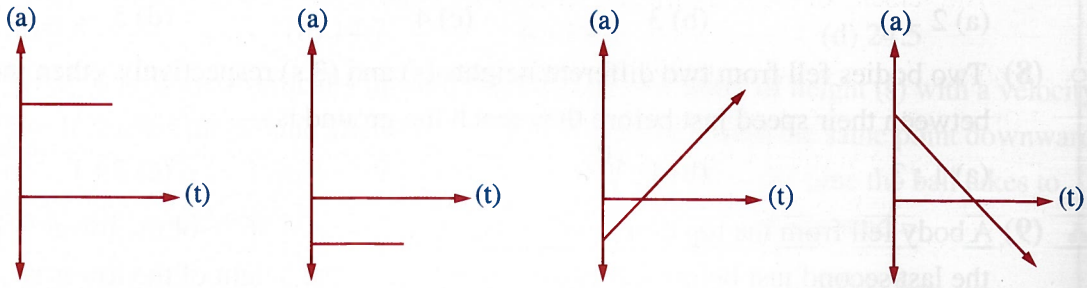
(2) The magnitude and the direction of the velocity of the stone after 4 seconds from the moment of its projection.

« 185 m. , 23.7 m./sec. downwards »

Third Higher skills

1 **Choose the correct answer from those given :**

(1) A boy stands on a bridge and projects a stone downward , assume the positive direction is upward , then which of the following graphs represents the (acceleration - time) graph of the stone motion ?



(a) (b) (c) (d)

(2) A particle is projected vertically upward , then the acceleration of the particle at its maximum height equals .....

(a) zero

(b) 9.8 m./sec^2 downward.

(c) 9.8 m./sec^2 upward.

(d) depends on the initial speed.

(3) The masses of two particles 10 kg. and 20 kg. The two particles fell from the same height. Ignoring the air resistance , if the particle of mass 20 kg. takes (t) sec. to reach the ground , then the time the other particle of mass 10 kg. takes to reach the ground = ... sec.

(a) t (b) 2 t (c) $\frac{1}{2}$t (d) $\frac{1}{4}$t

(4) Two balls are projected with the same initial speed from the top of a house one is projected upward and the other is projected downward. Compare their speed just before they reach the ground.

(a) The ball projected upward will be faster because its initial velocity upward.

(b) The ball projected downward will be faster because its initial velocity downward.

(c) They both have the same speed.

(d) The ball projected upward will be faster because its acceleration is greater.

(5) A body (A) fell from the top of a building , after one second another body (B) fell from the top of the same building , ignoring the air resistance , the difference between their speeds for subsequent time .....

(a) is increasing. (b) is decreasing.

(c) remains constant. (d) can not be determined.

(6) A body is projected vertically upward with speed 24.5 m./sec. , then the covered distance during the third second = ... m.

(a) zero (b) 4.9 (c) 2.45 (d) 24.5

(7) A body fell from the top of a tower , reaches to the ground surface after 8 seconds , then the time needed to coves $\frac{1}{4}$ the distance to the ground from the instant of falling is ..... seconds.

(a) 2 (b) 3 (c) 4 (d) 5

(8) Two bodies fell from two different heights (s) and (3 s) respectively , then the ratio between their speed just before they reach the ground is .....

(a) 1 : 3 (b) 1 : $\sqrt{3}$ (c) 1 : 9 (d) 3 : 1

(9) A body fell from the top of a tower. If the body covered 36 % of the tower height in the last second just before it hits the ground , then the height of the tower is ..... m.

(a) 50 (b) 75 (c) 100 (d) 122.5

(10) A body fell vertically downward from a height. If the ratio between the covered distance in the last second to the covered distance during the second before the last is 5 : 4 , then the time the body takes to reach the ground surface equals ..... seconds.

(a) 5 (b) $5\frac{1}{2}$ (c) 6 (d) $6\frac{1}{2}$

(11) An egg fell from a nest on a tree , the height of the nest is 2.5 m. from the ground. A girl is at a distance 13 m. from the base of the tree , runs with uniform velocity to catch up the egg just before it reached the ground , then the speed of the girl is ..... m./sec.

(a) 1.33 (b) 3.75 (c) 9.83 (d) 18.2

(12) A parachutist descends vertically downward with uniform speed , when he is at a distance (s) from the ground surface , a coin is dropped from him. If the speed of the parachutist just before he reached the ground is (v_1) and his taken time from the moment that the coin droped is (t_1) and the speed of the coin just before it reached the ground is (v_2) and its taken time is (t_2) , then

First : The relation between v_1 , v_2 is .....

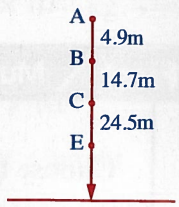
(a) $v_1 = v_2$ (b) $v_1 > v_2$ (c) $v_1 < v_2$ (d) $v_1 = \frac{1}{2} v_2$

Second : The relation between t_1 , t_2 is .....

(a) $t_1 = t_2$ (b) $t_1 > t_2$ (c) $t_1 < t_2$ (d) $t_2 = \frac{1}{2} t_1$

(13) In the opposite figure :

If a particle at (A) is dropped from the top of a tower freely , then the ratio among the time intervals which the particle takes to cover the distances AB , BC , CE are .....



(a) 1 : 1 : 1 (b) 1 : 2 : 3 (c) 1 : 3 : 4 (d) 1 : 4 : 9

(14) From the top of a 29.4 m. high tower , a particle (A) is projected vertically upward , at the same time another particle (B) is projected from the ground surface vertically upward with speed 24.5 m./sec. the two particles met at the top of the tower while the particle (B) was moving downward , then the initial velocity of the particle (A) = ... m./sec.

(a) 9.8 (b) 14.7 (c) 19.6 (d) 24.5

(15) A ball is projected vertically upward from the top of a tower of height (s) with a velocity (v). It reaches the ground after time (t_1). If it is projected from the same point downward with velocity (v) , it reaches the ground after time (t_2) , then the time the ball takes to reach the ground when it is fell down from the same point to the ground = ...

(a) $\frac{1}{2}(t_1 + t_2)$ (b) $t_1 + t_2$ (c) $\sqrt{t_1 t_2}$ (d) $t_1 t_2$

---

2 A stone is projected vertically upwards with velocity 34.3 m./sec. from the front part of a train of length 60 metres when the train begins to move from rest in a straight line with uniform acceleration 2 m./sec^2. Does the stone catch the train when it returns back to the point of projection and at where will this happen with respect to the back part of the train ?

« yes , 11 metres »

Exercise

4

Newton's universal gravitation law

From the school book

Remember · Understand · Apply · Higher Order Thinking Skills

First Multiple choice questions

Choose the correct answer from those given :

(1) What will happened to your weight when the distance between you and the earth increases ?

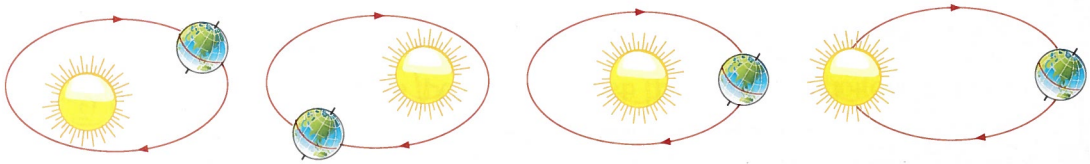
(a) Will increase. (b) No effect. (c) Become twice. (d) Will decrease.

(2) The physical attraction force between the orbs does not appear obviously because of .....

(a) the long distance among them. (b) the large mass of the planets.

(c) the short distance among them. (d) b and c all together.

(3) Which of the shown orbits can be a suitable orbit for a certain planet ?



(a) (b) (c) (d)

(4) The gravitational force between two masses each is 50 kg. and the distance between their centres is 50 cm. is ..... newton.

(a) 1 (b) 9.8 (c) 6.6×10^{-11} (d) 6.67×10^{-7}

Remark

consider the universal gravitational Constant $G = 6.67 \times 10^{-11}$ newton.m^2./kg^2

(5) Two balls , the mass of the first = 5.2 kg. and the mass of the second is 0.25 kg. the two balls are put such that the distance between their centers is 50 cm. , then the gravitational force between them = ... newton.

(a) 3.47×10^{-10} (b) 3.47×10^{-14} (c) 4.83×10^{-12} (d) 2.68×10^{-13}

(6) The universal gravitational force between two planets , the mass of the first is 2×10^{21} tons and the mass of the second is 4×10^{25} tons and the distance between their centres = 2×10^{6} km. is ..... newton.

(a) 2×10^{34} (b) 2.334×10^{30} (c) 2.668×10^{30} (d) 1.334×10^{24}

(7) A sphere of iron is put such that its centre at a distance of 40 cm. from centre of another sphere of nickel of mass 50 kg. such that the gravitational force between them equals 12×10^{-8} N , then the mass of the sphere of iron = ... kg.

(a) 14.393 (b) 5.757 (c) 3.84×10^{-10} (d) 3.865

(8) If you know that the gravitational force between sun and earth is 35.67×10^{21} newton and the mass of each of the earth and the sun are 5.97×10^{24} kg. and 19×10^{29} kg. , then the distance between the sun and earth = ... m.

(a) 6.36×10^{6} (b) 2.12×10^{22} (c) 1.8×10^{12} (d) 1.46×10^{11}

(9) A satellite of mass 4000 kg. rotates around the earth in an elliptic orbit at a height 440 km. from the ground surface. if the mass of the earth is 6×10^{24} kg. and its radius length = 6.36×10^{6} metres. , then the gravitational force between the earth and the satellite = ... newton.

(a) 34418 (b) 2.35×10^{11} (c) 34619 (d) 39575

(10) A satellite of mass $\frac{3}{2}$ tons rotates a round the earth at a constant height. if the mass of the earth is 6×10^{24} kg. and its radius length is 6360 km. and the gravitational force between the earth and the satellite = 1.26×10^{4} newton. , then the height of the satellite from the ground surface $\simeq$ ..... m.

(a) 542000 (b) 542381 (c) 576543 (d) 234561

(11) The gravity acceleration .....

(a) increases as the body mass increases.

(b) increases as the height of the body increases above the ground surface.

(c) increases as the body approaches to the ground surface.

(d) remains constant whatever the body goes far from the centre of the earth.

(12) If the mass of a body on the moon surface = 40 kg. , then its weight on the earth = ... N.

(a) 240 (b) 392 (c) 784 (d) 2352

(13) If the gravitational force between two bodies is F and the mass of each body has been decreased to half its mass without change the distance between them then the gravitational force becomes .....

(a) F (b) 2 F (c) $\frac{1}{2}$F (d) $\frac{1}{4}$F

(14) The gravitational force between two masses is 2 newtons if one mass is doubled , then the gravitational force between them becomes ..... newton.

(a) $\frac{1}{2}$ (b) 2 (c) 1 (d) 4

(15) What will happen to the gravitational force between two bodies as the distance between their centers becomes twice the first value ?

(a) It becomes twice its initial value. (b) It becomes 4 times its initial value.

(c) It becomes half its initial value. (d) It becomes the fourth of its initial value.

(16) A satellite of weight 5600 newton at the ground surface , then its weight at a height equals the length of the radius of the earth = ... newton.

(a) 2800 (b) zero (c) 1400 (d) 5600

(17) The gravitational force between two masses is 27 newton , the distance between their centres is increased to be 3 times its initial value , then the gravitational force becomes ..... newton.

(a) 81 (b) 9 (c) 3 (d) 27

(18) If the distance between the two centers of two masses is increased to become three times its initial value , then the gravitational force between them decreased , then the ratio between the two values of gravitational forces before the increase and after it = ...

(a) 3 : 1 (b) 1 : 3 (c) 9 : 1 (d) 1 : 9

(19) If the distance between the two centres of two masses is decreased , and the gravitational force between them became twice the first , then the ratio between the 1st and 2nd. distances = ...

(a) 2 : 1 (b) 1 : $\sqrt{2}$ (c) 1 : 2 (d) $\sqrt{2}$: 1

(20) Two planets , the mass of the first is twice the mass of the second , the radius length of the second is twice the radius length of the first , then the ratio between the gravity acceleration of the first to the gravity acceleration of the second is .....

(a) 8 : 1 (b) 4 : 1 (c) 2 : 1 (d) 1 : 1

(21) The masses of two planets are (4 m) , (9 m) kg. and their radii lengths are (2 r) , (3 r) metre , then the ratio between their gravity accelerations on their surfaces = ...

(a) $\frac{3}{8}$ (b) $\frac{2}{3}$ (c) $\frac{8}{27}$ (d) 1

(22) Two planets the mass of the first is 1.9×10^{19} kg. and its radius length is 2000 km. and the mass of the other is 3.8×10^{19} kg. and its radius length is 3000 km. , then the ratio between the two gravity accelerations of the two planet surfaces = ...

(a) 1 : 2 (b) 3 : 4 (c) 9 : 8 (d) 2 : 7

(23) The mass of a planet is three times the mass of the earth and its diameter length equals three times the diameter length of the earth. , then the ratio between the gravity acceleration on the surface of this planet and the surface of the earth = ...

(a) 1 : 9 (b) 1 : 3 (c) 9 : 1 (d) 3 : 1

(24) If the radii lengths of the moon and the earth are 1600 km. and 6400 km. respectively and the ratio between the gravity acceleration between them is 1 : 6 , then the ratio between their masses respectively = ...

(a) 1 : 24 (b) 24 : 1 (c) 96 : 1 (d) 1 : 96

(25) If r is the radius length of the earth , g_1 is the gravity acceleration of a body placed at a height of s_1 above the ground surface , g_2 is the gravity acceleration of the same body placed at a height of s_2 above the ground surface , then $\frac{g_1}{g_2}$ = ...

(a) $\frac{s_1}{s_2}$ (b) $\frac{s_2^2}{s_1^2}$ (c) $\frac{r + s_1}{r + s_2}$ (d) $\frac{(r + s_2)^2}{(r + s_1)^2}$

(26) Tension of the gravitational field of a planet whose mass m kg. and radius length r metre at a point h metre above the surface = ... newton/kg. (where G is the universal gravitation constant).

(a) $G \times \frac{m}{r^2}$ (b) $G \times \frac{m^2}{h^2}$ (c) $G \times \frac{m}{h^2 + r^2}$ (d) $G \times \frac{m}{(h + r)^2}$

(27) Given that the mass of the earth = 6.06×10^{24} kg. and its radius length is 6.36×10^6 metre , then the tension of the gravitational field of the earth on the ground surface = ... newton /kg.

(a) 9.8 (b) 9.81 (c) 9.993 (d) 9.89

(28) The gravity acceleration on the Jupiter given that Jupiter's mass is 1.898×10^{27} kg. and its radius length = 69911 km is ..... m./sec.^{2}

(a) 3.9×10^{11} (b) 9.8 (c) 25.9×10^6 (d) 25.9

(29) If the gravity acceleration of the earth (g) is 10 m./sec.^{2} and the radius length of the earth equals 6.36×10^6 metres. , then the mass of the earth = ... kg.

(a) 4.04×10^{19} (b) 5.943×10^{24} (c) 6.06×10^{22} (d) 6.06×10^{24}

(30) The mass of M planet ars given that its gravity acceleration is 3.711 m./sec.^{2} and its radius length = 3390 km. is ..... kg.

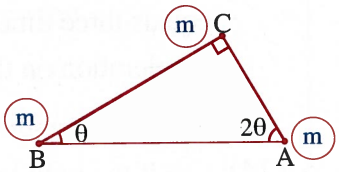
(a) 3.69×10^{23} (b) 8.34×10^{24} (c) 6.39×10^{23} (d) 4.265×10^{13}

(31) From a point on the moon surface , an astronaut projects a ball vertically upward with initial velocity 14 m./sec. , then the maximum height the ball reaches = ... metre. (given that gravitational acceleration at the moon surface = $\frac{49}{30}$ m./sec^2.)

(a) 2.5 (b) $4\frac{2}{7}$ (c) 15 (d) 60

(32) In the opposite figure :

Three equal masses are placed at the vertices of a right-angled triangle. F_{AB} is the mutual gravitational attraction between the two masses at A and B , then .....

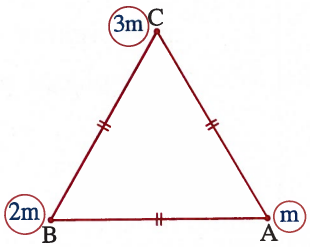


(a) $F_{AB} > F_{AC} > F_{BC}$ (b) $F_{AB} > F_{BC} > F_{AC}$

(c) $F_{AB} < F_{BC} < F_{AC}$ (d) $F_{AB} < F_{AC} < F_{BC}$

(33) In the opposite figure :

Three masses m , 2 m , 3 m are placed at the vertices of an equilateral triangle. F_{AB} is the mutual gravitational attraction between the two masses at A and B , then .....

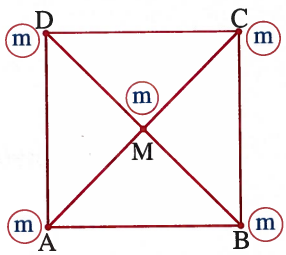


(a) $F_{AB} > F_{AC} > F_{BC}$ (b) $F_{AC} < F_{BC} < F_{AB}$

(c) $F_{BC} > F_{AC} > F_{AB}$ (d) $F_{BC} < F_{AB} < F_{AC}$

(34) In the opposite figure :

Four bodies , the mass of each is m , they are placed at vertices of a square the length of its diagonal is 2 s. If a body of mass m is placed at the centre of the square , then the gravitational force acting on the body at the centre = ...



(a) Zero (b) $G\left(\frac{m}{s}\right)^2$

(c) $2\,G\left(\frac{m}{s}\right)^2$ (d) $4\,G\left(\frac{m}{s}\right)^2$

Second Essay questions

1 Calculate the gravitational force between the sun and the earth given that the earth moves in an elliptic orbit a round the sun and the mass of the earth equals 6×10^{24} kg. and the mass of the sun equals 19×10^{29} kg. and the distance between their centres equals 1.5×10^{11} metres.

« 3.379×10^{22} newton »

2 If you know that the mass of the earth is 6×10^{24} kg. and the mass of the moon is 7×10^{22} kg. and the distance between their centers is 3×10^{6} metres and the universal gravitational constant is 6.67×10^{-11} newton .m^2/kg^2. Find the gravitational force of the earth to the moon.

« 3.11×10^{24} newton »

3 A rocket of mass 8 tons. is projected from the ground surface and when it became at a distance 150 km. from the ground surface it lost $\frac{1}{4}$ its mass because of burning the fuel. Calculate its weight at this moment given that the mass of the earth = 5.97×10^{24} kg. and its radius length = 6360 km.

« 56375 newtons »

4 A satellite of mass m kg. rotates at a height 440 km. from the ground surface , given that the mass of the earth is 6×10^{24} kg. and its radius length = 6360 km. Find m to nearest kg. given that the universal gravitational constant = 6.67×10^{-11} newton.m^2/kg^2 , and the gravitational force between the earth and the satellite is 17310 newton.

« 2000 kg. »

5 Given that the mass of the earth is 5.97×10^{24} kg. and its radius length is 6.34×10^{6} metres Find the tension of gravitational field of earth to a body of mass 1000 kg. putting on the ground surface , then find the gravity acceleration of the earth.

« 9.9×10^{3} newton , 9.9 m./sec.^{2} »

6 If the mass of the earth equals 81 times the mass of the moon and their diameters lengths are 12756 km. and 3476 km. respectively , if the gravity acceleration on the earth is 9.8 m./sec^2 , what is the gravity acceleration on the moon surface ?

« 1.63 m./sec^2 »

7 If the mass of mars is 0.107 times the mass of the earth and the radius of the earth = 6400 km. and the gravity acceleration on mars surface equals 0.38 times the gravity acceleration of the earth. Calculate the radius length of mars.

« 3.3961×10^{6} metres »

8 Given that the mass of the earth equals 5.97×10^{24} kg. and its radius length is 6.34×10^{6} metres and the mass of the moon equals 7.36×10^{22} kg. Find the radius length of the moon if the gravity on the earths's surface = 6 times the gravity on the moon's surface.

« 1.724×10^{6} metres »

9 An international space station with weight on the surface of the earth 421997.6 newton. Find its weight when it became in an external orbit on a height 350 km. from the surface of the earth known that the earth's mass equals 5.6×10^{24} and its radius is 6.37×10^{3} km. (Hint : Force in newton = Mass in kg × gravitational force of the earth 9.8 m./sec^2)

« 3.79×10^{5} newton »

10 A space ship of weight 219600 newton on the ground surface and its weight on mars planet is 83157 newton. if the mass of the earth is 6×10^{24} kg. and its radius length is 6360 km. and the mass of mars is 6.39×10^{23} kg. Find the radius length of mars.

« 3.373×10^{6} metres »

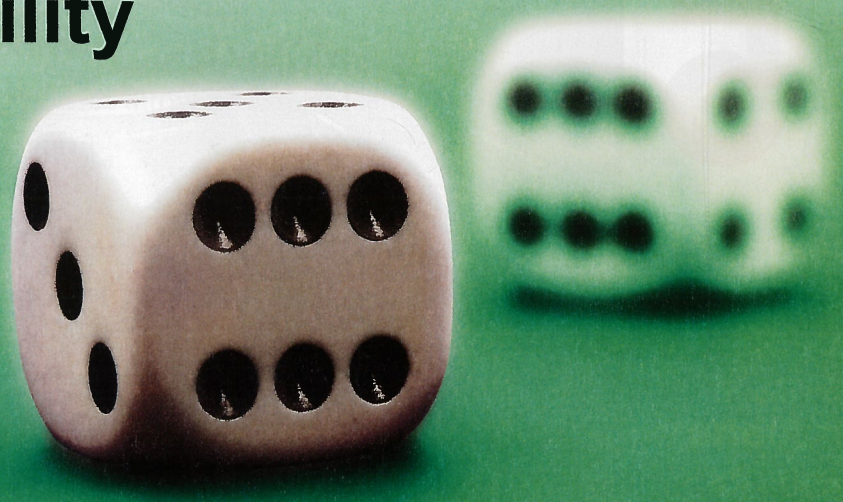
---

11 A ball fell down from the hand of an astronaut at a height 735 cm. from the moon surface to strike the moon surface after 3 seconds. if the mass of the moon is 7.36×10^{22} kg. and the mass of the earth is 5.97×10^{24} kg. and the radius length of the earth is 6.34×10^{6} metre and the gravity acceleration of the earth is 9.8 m./sec.^{2} Find the radius length of the moon.

« 1724315 metres »

Unit Two

Probability



Exercise 5

Some basic terms and concepts – Events – Operations on events.

Exercise 6

Axioms and laws of probability – Calculating probability.

Exercise

5

Some basic terms and concepts – Events – Operations on events

From the school book

Remember Understand Apply Higher Order Thinking Skills

First Multiple choice questions

Choose the correct answer from those given :

(1) In the experiment of choosing a digit from the digits of the number 26345 randomly , then the sample space is .....

(a) $\{5 , 4 , 3 , 2\}$ (b) $\{45 , 63 , 2\}$

(c) $\{26345\}$ (d) $\{6 , 2 , 3 , 5 , 4\}$

(2) Drawing a card from numbered cards without knowing the numbers written on these cards represents .....

(a) a random experiment. (b) a not random experiment

(c) an impossible event. (d) a certain event.

(3) When tossing a die once and observing the number on its upper face , if A is the event of appearance of an even prime number , then A is ..... event.

(a) impossible (b) simple (c) not simple (d) certain

(4) In the experiment of shooting at a target , denoting hitting the target by the symbol H , not hitting the target by the symbol N and the experiment is shooting 3 times at most and it stoped when hitting the target, then the sample space = ...

(a) $\{N , (N , H) , (N , N , H) , (N , N , N)\}$

(b) $\{H , (H , H , N) , (H , N , N) , (N , N , N)\}$

(c) $\{(N , N) , (N , N , H) , H\}$

(d) $\{(N , N , N) , (N , N , H) , (N , H) , H\}$

(5) In the experiment of tossing three distinct coins once and observing the sequence of appearance of heads and tails , then number of the elements of the sample space = ...

(a) 8 (b) 3 (c) 27 (d) 64

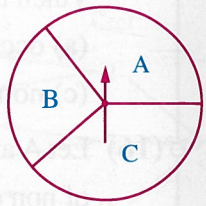
(6) In the experiment of throwing a die three times successively , then number of sample space elements = ...

(a) 27 (b) 81 (c) 36 (d) 216

(7) In the experiment of shooting on a target where the experiment stopped at hitting the target twice or missing the target twice , then the number of elements of the sample of space = ...

(a) 9 (b) 8 (c) 4 (d) 6

(8) When throwing a fair die once , then spinning the spinner in the figure once , then the number of elements of the sample space = ...

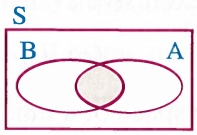


(a) 18 (b) 12

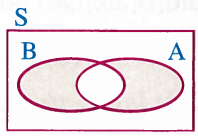
(c) 3 (d) 6

(9) Which of the following figures does represent the occurrence of any of the two events A or B without occurrence the other ?

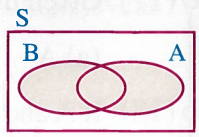
(a)



(b)

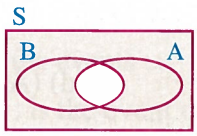


(c)

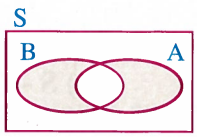


(d)

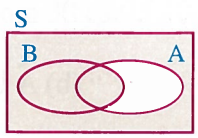
(10) In which of the following shapes , the shaded part represents $\grave{A} \cup \grave{B}$?



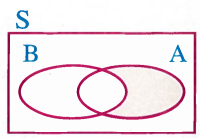
(a)



(b)

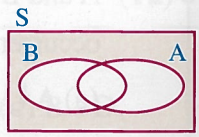


(c)



(d)

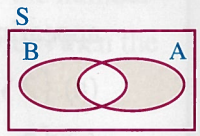
(11) If A and B are two events from the sample space S , then the shaded part in the opposite figure represents .....



(a) $A \cup B$ (b) $\grave{A} \cap \grave{B}$

(c) $\grave{A} \cup \grave{B}$ (d) $A \cap \grave{B}$

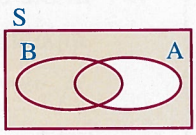
(12) If A and B are two events from the sample space S , then the shaded part in the opposite figure represents .....



(a) $A \cup B$ (b) $\grave{A} \cap \grave{B}$

(c) $(A \cap B)\grave{}$ (d) $(A \cup B) - (A \cap B)$

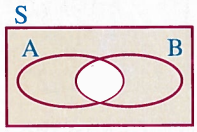
(13) If A and B are two events from the sample space S , then the shaded part in the opposite figure represents .....



(a) $A - B$ (b) $B \cup A$

(c) $\grave{A} \cup B$ (d) $\grave{A}$

(14) In the opposite figure :



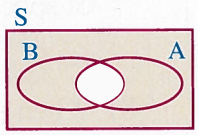
The shaded part represents the event .....

(a) occurrence of A and B

(b) occurrence of A or B or both together.

(c) occurrence of one event at least. (d) occurrence of one event at most.

(15) In the opposite figure :



A , B are two events in a sample space S of a random experiment , then the shaded part represents the event of .....

(a) occurrence of A or B (b) non occurrence of A and B together.

(c) non occurrence of B (d) non occurrence of A or B

(16) Let A and B are two events in a sample space of a random experiment , then the event of non occurrence any of the two events equals .....

(a) $A \cap B$ (b) $A - B$ (c) $\grave{A} \cap \grave{B}$ (d) $\grave{A} \cup \grave{B}$

(17) Given that : A and B are two mutually exclusive events then : $A - B =$ .....

(a) A (b) B (c) $B - A$ (d) $\grave{A}$

(18) If A and B are two events of the sample space of a random experiment , then the event of occurrence B only = ...

(a) B (b) $A \cap B$ (c) $A - B$ (d) $B - A$

(19) $(A \cup B)\grave{} =$ .....

(a) $\grave{A} \cap \grave{B}$ (b) $\grave{A} \cup \grave{B}$ (c) $S - (A \cap B)$ (d) $(A \cap B)\grave{}$

(20) $(A - B)\grave{} =$ .....

(a) $S - A$ (b) $B \cup \grave{A}$ (c) $(B - A)\grave{}$ (d) $\grave{A} \cup (B - A)$

(21) A and B are two events of the sample space of a random experiment , then the event of occurrence A and B together is .....

(a) $A \cup B$ (b) $(A \cap B)\grave{}$ (c) $\varnothing$ (d) $A \cap B$

(22) A card is drawn from 10 identical cards , numbered from 1 to 10 , then the event of appearing a number divisible by 2 on the card is .....

(a) $\{2 , 6\}$ (b) $\{2 , 4 , 6 , 8\}$

(c) $\{2 , 4 , 6 , 8 , 10 , 12\}$ (d) $\{2 , 4 , 6 , 8 , 10\}$

(23) A coin is tossed twice , and the upper face is noticed , then the event of appearing tail in the first trial is .....

(a) $\{(T , H)\}$

(b) $\{(T , H) , (T , T)\}$

(c) $\{(T , H , H) , (T , T , H) , (T , H , T) , (T , T , T)\}$

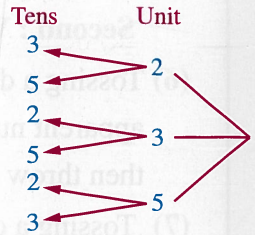
(d) $\{(T , H) , (H , T) , (T , T)\}$

(24) When tossing a metal coin and a die once , then the event of appearing a tail and number less than 3 , is .....

(a) $\{(T , 3)\}$ (b) $\{(T , 4) , (T , 5) , (T , 6)\}$

(c) $\{(T , 1) , (T , 2) , (T , 3)\}$ (d) $\{(T , 1) , (T , 2)\}$

(25) In the experiment of forming 2-digit number formed from different digits using the set $\{2 , 3 , 5\}$, the opposite tree chart is used , then the number of elements of the event "the formed number is odd" is .....



(a) 6 (b) 3

(c) 4 (d) 2

(26) In the experiment of tossing a die once , then which of the following is simple event ?

(a) The event of appearing a prime number.

(b) The event of appearing a number greater than or equal to 5

(c) The event of appearing a number greater than 6

(d) The event of appearing an even number has only two different factors

(27) In an experiment of selecting a card randomly from 30 cards numbered from 1 to 30. If the events :

A : is the event of getting an even number

B : is the event of getting a number divisible by 11

C : is the event of getting a prime number

D : is the event of getting a number divisible by 3

then the two mutually exclusive events from the following are .....

(a) B , A (b) B , C (c) A , C (d) B , D

(28) An experiment consists of tossing a die, and then flipping a coin once if the number on the die is even. If the number on the die is odd, the coin is flipped twice, then the number of the elements of the sample space = ...

(a) 24 (b) 18 (c) 36 (d) 12

Second Essay questions

1 **Determine the sample space of each of the following random experiments , showing the number of its elements :**

(1) Choosing a prime number included between 10 and 20

(2) Tossing three distinct coins once and observing the sequence of appearance of heads and tails.

(3) Getting a number formed from two different digits from the digits 1 , 2 , 3 , 4

(4) Getting a number formed from two digits from the digits 0 , 1 , 2

(5) A bag contains 4 balls (red , white , black and yellow) the experiment is drawing 2 balls one after another and observing their colours.

First : With restoring (restore the 1st ball before drawing the second)

Second : Without restoring.

(6) Tossing a die once and observing the apparent number on the upper face. If the apparent number is less than 6 , then throw a coin once. If the number 6 appears , then throw the coin two consecutive times.

(7) Tossing a coin and a die in which two faces carries number (1) , two faces carries number (2) and two faces carries number (3) , and observing the appearing on the two upper faces.

(8) Tossing a coin three times and observing the number of heads.

---

2 **In an experiment , a die is tossed once and the apparent number on the upper face was observed. Determine the sample space , then state each of the following events , showing which of these events is simple , which of them is sure and which is impossible :**

(1) A : the event of appearance of the digit 4

(2) B : the event of non-appearance of the digit 5

(3) C : the event of appearance of a number greater than 3

(4) D : the event of appearance of a number less than 8

(5) E : the event of the appearance of a number divisible by 7

(6) F : the event of the appearance of a prime number.

(7) K : the event of the appearance of a prime odd number.

(8) L : the event of the appearance of an even number or prime number.

(9) N : the event of the appearance of a number which is not a perfect square.

(10) X : the event of the appearance of a number x satisfying the equation $x(x-2) = 15$

(11) Y : the event of the appearance of a number x satisfying the inequality $x \leq 4$

3 **A bag contains 20 identical cards numbered from 1 to 20 , if a card is selected randomly and the number written on it is recorded , write the following events :**

(1) A : the event «the recorded number is even and greater than 10»
(2) B : the event «the recorded number is a factor of 12»
(3) C : the event «the recorded number is odd and divisible by 3»
(4) D : the event «the recorded number is a multiple of the two numbers 2 , 5»
(5) E : the event «the recorded number is prime».
(6) F : the event «the recorded number satisfies the inequality $5x - 3 \leq 17$»

---

4 **In the experiment of throwing a die once and observing the apparent number on the upper face , write the sample space (S) and determine the following events :**

(1) A : the event of appearance of an odd number.
(2) B : the event of appearance of a prime number.
(3) The event of occurrence of A and B together.
(4) The event of occurrence of one of them at least.
(5) The event of non-occurrence of A
(6) The event of occurrence of A only.
(7) The event of occurrence of B only.
(8) The event of occurrence of one of them only.
(9) The event of occurrence of one of them at most.

---

5 **In an experiment , a coin was flipped twice in succession and the sequence of appearance of heads and tails was observed.**
Write down the sample space , then state each of the following events :

(1) A : getting a tail in the first flip.
(2) B : getting a tail in one only of the two flips.
(3) C : getting a head in the first flip or a tail in the second flip.
(4) D : non-appearance of a head.
(5) E : getting the same outcome in the two flips.
(6) F : the appearance of different outcomes in the two flips.

---

6 **A coin is tossed twice. The sequence of appearance of heads and tails is observed. Write down the sample space for this experiment. Also , determine the following events :**

(1) A : the appearance of exactly one head.
(2) B : the appearance of at least one head.
(3) C : the appearance of at most one head.
(4) D : the appearance of exactly two heads.
(5) E : the appearance of more than two heads.

, then show which of them is a simple event.

7 📖 **In the experiment of throwing a coin several times , the experiment will stop if a head or 3 tails appear. Write down the sample space of the experiment and the following events :**

(1) A : the event of the appearance of one head at most.

(2) B : the event of the appearance of one head at least.

(3) C : the event of the appearance of two tails at least.

(4) D : the event of the appearance of two heads at least.

---

8 📖 **From the set of numbers $\{1 , 2 , 3 , 4\}$ we need to form 2-different digit numbers. Represent the sample space (S) on a graphic tree , then determine the following events :**

(1) A : the event of the unit digit is odd.

(2) B : the event of the tens digit is odd.

(3) C : the event of each of the two digits is odd.

(4) D : the event of the unit digit or the tens digit is odd.

(5) E : the event of the set of numbers in which the unit digit is twice the tens digit.

---

9 **A bag contains 3 red and 3 white balls. Three balls are drawn randomly without replacement. Write down the sample space , then determine the following events :**

(1) A : the event of getting at least two red balls.

(2) B : the event of getting at most two white balls.

(3) C : the event of getting two balls of the same colour.

(4) $A \cap B$ (5) $B \cap C$ (6) $C - A$

---

10 📖 **Two cards are drawn one after the other from a set of 8 identical cards numbered from 1 to 8 and the drawn card must returned before drawing the another card. What is the number of the elements in the sample space ? and if :**

(1) A : the event of "the number in the 2^{nd} drawn is triple the number in the 1^{st} drawn".

(2) B : the event of "the sum of the two numbers is more than 13"

Write each of A and B , is A and B are mutually exclusive ? Explain your answer.

---

11 **In the experiment of throwing a die twice in succession and observing the apparent number on the upper face in each time, draw a geometric shape for the sample space S and show on it each of the following events :**

(1) A : the event of the appearance of the number 3 in the 1^{st} throw.

(2) B : the event of the appearance of the number 3 in the 2^{nd} throw.

(3) C : the event of the appearance of the number 3 in any of the two throws.

(4) D : the event of the appearance of a number in the first throw exceeding 2 than the number in the 2nd throw.

(5) E : the event of the appearance of a number in the 2nd throw exceeding 1 than the number in the 1st throw.

---

12 **A die is thrown twice. The number on the upper face is observed in each time. Determine each of the following events :**

(1) A : the sum of the scores is 8

(2) B : the sum of the scores is 10

(3) C : the sum of the scores is 8 or 10

(4) D : the sum of the scores is 15

(5) E : the event of the appearance of two equal numbers.

---

13 **In an experiment of throwing two distinct dices and observing the two apparent numbers on the upper faces , write down each of the following events :**

(1) A_1 : the event of (the absolute difference between the apparent numbers = 3)

(2) A_2 : the event of (the sum of the apparent numbers = 10 at least)

(3) A_3 : the event of (the small number in the two apparent numbers = 4)

(4) $A_2 \cap \grave{A}_3$ (5) $A_3 \cap \grave{A}_2$

(6) A_4 : the event of (the greater number in the apparent numbers ≤ 3)

(7) A_5 : the event of (the greater number in the apparent numbers ≥ 5)

Show each of A_4 & A_5 on the geometric shape of sample space S

---

14 **In an experiment of tossing a coin once , then a die is rolled , observing the upper faces.**

Represent the sample space of this experiment by a probability tree diagram , and then determine the following events :

(1) A : the event of appearance of a tail and an even number.

(2) B : the event of appearance of a head and an odd number.

(3) C : the event of occurrence of A and occurrence of B

(4) D : the event of occurrence of A only.

(5) E : the event of non-occurrence of A or non-occurrence of B

---

15 **An experiment consists of flipping a coin , and then flipping it a second time if a head occurs. If a tail occurs on the first flip , then a die is tossed once.**

List the elements of the sample space , then determine the following events :

(1) A : the appearance of a tail and an even number.

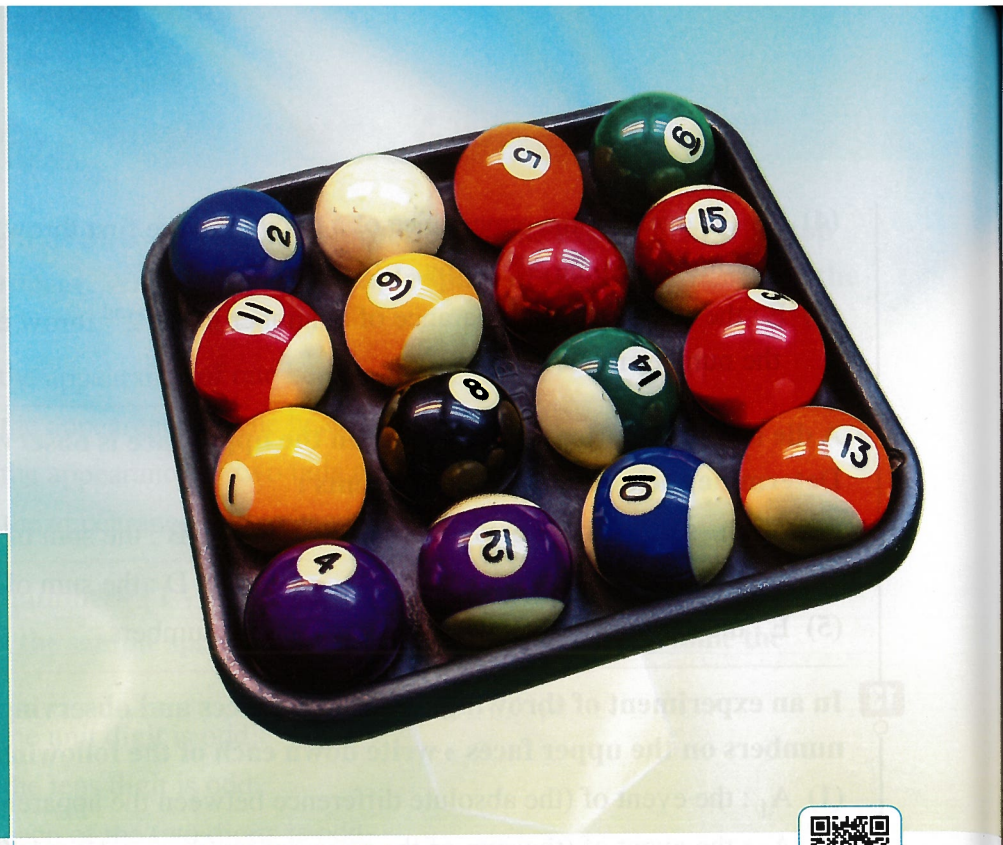
(2) B : the appearance of at least one head.

(3) C : the appearance of a tail and a prime number.

Exercise

6

Axioms and laws of probability – Calculating probability



From the school book | Remember | Understand | Apply | Higher Order Thinking Skills

Test yourself

First Multiple choice questions

Choose the correct answer from those given :

(1) The probability of the certain event = ...

(a) $\varnothing$ (b) S (c) zero (d) 1

(2) If the probability of occurrence of event A = $\frac{3}{5}$, then the probability of non-occurrence of event A = ...

(a) 0.6 (b) $\frac{1}{5}$ (c) zero (d) 40 %

(3) If P (A) = $\frac{1}{4}$, P (B) = $\frac{2}{3}$, P (A $\cap$ B) = $\frac{1}{6}$, then P (A $\cup$ B) = ...

(a) $\frac{11}{12}$ (b) $\frac{7}{12}$ (c) $\frac{2}{3}$ (d) $\frac{3}{4}$

(4) If P (A) = 0.52 , P (B) = 0.56 , P (A $\cup$ B) = 0.86 , then P (A $\cap$ B) = ...

(a) 0.22 (b) 0.3 (c) 0.31 (d) 0.34

(5) If P (A) = 0.4 , P (A $\cap$ B) = 0.1 , then P (A – B) = ...

(a) 0.1 (b) 0.2 (c) 0.3 (d) 0.5

(6) If P (A $\cap$ B) = 0.6 , P (B – A) = 0.1 , then P (B) = ...

(a) 0.1 (b) 0.5 (c) 0.6 (d) 0.7

(7) If P (A) = 0.6 , P (B – A) = 0.3 , then P (A $\cup$ B) = ...

(a) 0.3 (b) 0.7 (c) 0.9 (d) 1

(8) If $A \cap B = \varnothing$, $P(\grave{A}) = 0.7$, $P(\grave{B}) = 0.4$, then $P(A \cup B) =$ .....

(a) 0.8 (b) 0.3 (c) 1 (d) 0.9

(9) If A and B are two events of a sample space of random experiment $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{2}$, $P(A \cap \grave{B}) = \frac{3}{4}$, then $P(A \cup B) =$ .....

(a) $\frac{1}{4}$ (b) $\frac{2}{3}$ (c) $\frac{7}{12}$ (d) $\frac{1}{2}$

(10) If A and B are two events in sample space of a random experiment where : $P(A) = 0.4$, $P(B) = 0.5$, $P(A \cap B) = 0.2$, then the probability of non occurrence of any of the two events A or B = ...

(a) 0.5 (b) 0.7 (c) 0.3 (d) 0.9

(11) If A and B are two mutually exclusive events from the sample space S , $P(\grave{B}) = \frac{1}{4}$ and $P(A \cup \grave{B}) = 0.05$, then $P(A) =$ .....

(a) 0.75 (b) 0.7 (c) 0.95 (d) 0.2

(12) If A , B are two events from sample space of a random experiment and $A \subset B$, $P(A \cap B) = \frac{2}{5}$, $P(A \cup B) = \frac{4}{5}$, then $P(A) =$ .....

(a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{4}{5}$

(13) A fair die is thrown two consecutive times , then :

The probability of getting number 5 in any throw and 6 in the other throw is .....

(a) $\frac{1}{36}$ (b) $\frac{1}{6}$ (c) $\frac{1}{18}$ (d) $\frac{1}{9}$

(14) If a letter is chosen randomly from a set of letters $S = \{A , B , T , D , H , O , I , K , N , Z\}$, then the probability that the chosen letter is one of the letters of the word THINK is .....

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

(15) A class contains 42 students and 35 of them succeeded at the end of the year. A student is chosen randomly , then the probability that this student failed = ...

(a) $\frac{5}{6}$ (b) $\frac{1}{6}$ (c) zero (d) 1

(16) A coin is tossed once , then the probability of the appearance of a head or a tail = ...

(a) zero (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) 1

(17) A coin is tossed twice , then the probability of appearance one head at most = ...

(a) $\frac{3}{4}$ (b) $\frac{1}{2}$ (c) $\frac{2}{3}$ (d) $\frac{1}{4}$

(18) A box contains 30 identical cards , numbered from 1 to 30 , a card is drawn at random from the box. then the probability that the card has odd number which is a perfect cube = ...

(a) zero (b) $\frac{1}{10}$ (c) $\frac{1}{30}$ (d) $\frac{1}{15}$

(19) If $P(A) = 0.3$, $P(B) = 0.5$, $P(A \cap B) = 0.1$, then $P(\grave{A} \cap \grave{B}) =$ .....

(a) 0.7 (b) 0.4 (c) 0.3 (d) 0.1

(20) If A , B are two mutually exclusive events , then $P(\grave{A} \cup \grave{B}) =$ .....

(a) zero (b) 1 (c) 0.5 (d) 50 %

(21) If A and B are two events from the sample space of a random experiment and $P(A) = \frac{1}{4}$, $P(A \cap B) = \frac{1}{5}$, then $P(\grave{A} \cup B) =$ .....

(a) $\frac{19}{20}$ (b) $\frac{1}{20}$ (c) $\frac{7}{20}$ (d) $\frac{13}{20}$

(22) If $P(A) = \frac{1}{2}$, $P(B) = \frac{2}{5}$, $P(A \cup B) = \frac{4}{5}$, then $P(\grave{A} \cap B) =$ .....

(a) $\frac{1}{10}$ (b) $\frac{3}{10}$ (c) $\frac{3}{5}$ (d) 0.6

(23) If A and B are two events from the sample space of a random experiment , $P(A) = \frac{1}{2}$, $P(A \cup B)\grave{} = \frac{1}{3}$, $A \subset B$, then $P(B) =$ .....

(a) $\frac{1}{6}$ (b) $\frac{2}{3}$ (c) $\frac{1}{12}$ (d) $\frac{5}{6}$

(24) If A and B are two events from the sample space of a random experiment , $P(A \cup B) = 0.85$, $P(A) = 0.75$, $P(\grave{B}) = 0.6$, then $P(\grave{A} \cup \grave{B}) =$ .....

(a) 0.3 (b) 0.4 (c) 0.15 (d) 0.7

(25) If A and B are two mutually exclusive events from the sample space of a random experiment , $P(A) = \frac{2}{3}$ and $P(A - B) =$ .....

(a) Zero (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) 1

(26) Let A and B be two events in the sample space (S) of a random experiment such that : $P(A) = P(B)$ if $P(A \cap B) = 0.2$ and $P(A \cup B) = 0.8$, then $P(\grave{A} \cap B) =$ .....

(a) 0.5 (b) 0.3 (c) 0.8 (d) 0.2

(27) If A and B are two events of the sample space (S) , and $P(A) : P(B) = 2 : 3$, $P(A \cap B) = 0.1$, $P(A \cup B) = 0.7$, then $P(A) =$ .....

(a) 0.16 (b) 0.48 (c) 0.32 (d) 0.6

(28) A box contains 9 identical cards numbered from 1 to 9 one card is chosen randomly , then the probability that the chosen card carries an odd number or a number divisible by 9 = ...

(a) $\frac{1}{3}$ (b) $\frac{7}{9}$ (c) $\frac{1}{2}$ (d) $\frac{5}{9}$

(29) A card is drawn randomly from 50 identical cards numbered from 1 to 50 , then the probability that the number on the drawn card is a perfect square is .....

(a) 20% (b) 14% (c) 12% (d) 6%

(30) A set of 50 identical cards , numbered from 1 to 50 , then the probability that the number of the drawn card is not a perfect square number and not a multiple of number 7 is .....

(a) $\frac{7}{50}$ (b) $\frac{33}{50}$ (c) $\frac{37}{50}$ (d) $\frac{13}{50}$

(31) A bag contains 25 balls (4 balls are yellow , 7 balls are red and the remainder is black) If a ball is drawn randomly , then the probability that the drawn ball is yellow or black = ...

(a) $\frac{7}{25}$ (b) $\frac{4}{25}$ (c) $\frac{18}{25}$ (d) $\frac{14}{25}$

(32) A box contains 20 identical cards , numbered from 1 to 20. A card is drawn randomly , then the probability that the card has a prime number greater than 10 is .....

(a) $\frac{1}{10}$ (b) $\frac{1}{5}$ (c) $\frac{3}{10}$ (d) $\frac{1}{4}$

(33) If A and B are two events from the sample space of a random experiment , $P(A) = \frac{9}{20}$, $P(B) = \frac{3}{10}$, $P(A \cup B) = 2\,P(A \cap B)$, then $P(A \cap \grave{B}) =$ .....

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{5}$ (d) $\frac{1}{6}$

(34) If A and B are two events from the sample space S of a random experiment , $P(\grave{A}) = \frac{3}{5}$ $P(A \cup B) = 0.45$, $P(A - B) = 0.2$, then $P(B) =$ .....

(a) 0.75 (b) 0.6 (c) 0.65 (d) 0.55

(35) If A and B are two events of the sample space and $P(A) = 3\,P(\grave{A})$, $P(A \cap B) = 0.2$, then probability of occurrence event A only = ...

(a) 0.55 (b) 0.05 (c) 0.3 (d) 0.75

(36) If A , B are two events in the sample space of a random experiment and $B \subset A$, $P(A) = 2\,P(B) = 0.6$, then $P(A - B) =$ .....

(a) 0.3 (b) 0.5 (c) 0.6 (d) 0.8

(37) If S is the sample space of a random experiment and $A \subset S$, $\frac{P(\grave{A})}{P(A)} = \frac{3}{5}$, then $P(A) =$ .....

(a) $\frac{1}{8}$ (b) $\frac{3}{8}$ (c) $\frac{5}{8}$ (d) $\frac{2}{5}$

(38) If A and B are two events from the sample space of a random experiment , $P(\grave{A}) = P(A)$, $P(A \cap B) = \frac{1}{3}$, then $P(A - B) =$ .....

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{5}{6}$ (d) $\frac{1}{6}$

(39) If A , B are two events in the sample space S of a random experiment and $A \subset B$, $P(A) = \frac{1}{2}$, the probability of occurrence B only equals 0.2 , then the probability of non-occurrence B = ...

(a) 0.1 (b) 0.3 (c) 0.7 (d) 0.9

(40) 5 identical cards numbered from 2 to 6 , two cards drawn (one after the other) with replacement and observing the sequence of the numbers to form all possible 2-digits numbers , then the probability that the formed number is of units digit is prime or of tens digit is odd is .....

(a) $\frac{3}{5}$ (b) $\frac{2}{5}$ (c) $\frac{23}{25}$ (d) $\frac{19}{25}$

(41) A box contains 8 cards numbered from 1 to 8 two cards are drawn successively with replacement , then the probability that the absolute difference between the two numbers is equal to 3 is .....

(a) $\frac{5}{32}$ (b) $\frac{2}{17}$ (c) $\frac{21}{64}$ (d) $\frac{1}{4}$

(42) If A and B are two events of a random experiment , its elements have equal probabilities , and $P(B) = \frac{1}{2}$, $P(A) = 1 - P(B)$, then .....

(a) $n(A) = n(B)$ (b) $n(A) > n(B)$ (c) $n(A) < n(B)$ (d) $n(A) + n(B) = 1$

(43) A die is designed such that while tossing it , the probabilities of getting the numbers 1 , 2 , 3 , 4 and 5 are equal but the probability of getting the number 6 equals three times that getting the number 1 , then the probability of getting an even number = ...

(a) $\frac{1}{2}$ (b) $\frac{3}{8}$ (c) $\frac{5}{8}$ (d) $\frac{3}{4}$

(44) A fair die is thrown once on a table and observing the number on the upper face , then the probability of getting a number not more than 5 , and not less than 3 is .....

(a) $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

(45) In the experiment of rolling a dice twice the probability that the sum of the appearing numbers on the upper face is a prime number = ...

(a) $\frac{7}{18}$ (b) $\frac{1}{2}$ (c) $\frac{5}{11}$ (d) $\frac{5}{12}$

(46) A fair die is thrown three consecutive times , then the probability of getting three similar numbers = ...

(a) $\frac{1}{36}$ (b) $\frac{1}{6}$ (c) $\frac{5}{6}$ (d) $\frac{1}{216}$

(47) A fair die is thrown once , the probability of the appearance of an even number not a prime is .....

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\frac{1}{6}$ (d) $\frac{5}{6}$

(48) A dice is rolled 3 times and the number on the upper face is observed , then the probability that the sum of these numbers is 18 equals .....

(a) $\frac{1}{6}$ (b) $\frac{1}{36}$ (c) $\frac{1}{216}$ (d) $\frac{1}{108}$

(49) A fair die is thrown once , if (A) is the event of getting an odd number and (B) is the event of getting a number less than 5 , then the probability of occurrence one of the two events at least = ...

(a) $\frac{1}{6}$ (b) $\frac{1}{2}$ (c) $\frac{5}{6}$ (d) $\frac{1}{3}$

(50) A fair die is thrown two consecutive times , then the probability of getting even number in the 1st throw and getting prime number in the 2nd throw is .....

(a) $\frac{1}{3}$ (b) $\frac{1}{6}$ (c) $\frac{1}{9}$ (d) $\frac{1}{4}$

(51) In the experiment of tossing a coin three consecutive times and observing the sequences of heads and tails then probability of the event of appearance "at least two tails" = ...

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{6}$ (d) $\frac{3}{8}$

(52) Let A , B and C be three mutually exclusive events of the sample space (S) of a random experiment S such that $S = A \cup B \cup C$, $P(A) = P(B)$ and $P(C) = \frac{1}{2} P(A)$, then $P(A - C)$ = ...

(a) $\frac{4}{5}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{1}{2}$

(53) If A , B are two events in the sample of a random experiment and $P(A) = 0.5$, $P(A \cup B) = 0.6$, $P(A \cap \grave{B}) = 0.3$, then $P(B)$ = ...

(a) 0.2 (b) 0.3 (c) 0.5 (d) 0.9

(54) If the sample space of a random experiment is $S = \{A , B , C , D\}$, and $P(\{B\}) = 0.33$, $P(\{B , C\}) = 0.45$, $P(\{B , D\}) = 0.65$, then $P(\{A\})$ = ...

(a) 0.77 (b) 0.23 (c) 0.11 (d) 0.01

(55) If $S = \{A , B , C\}$ is the sample space of a random experiment , and $20 P(A) = 15 P(B) = 12 P(C)$, then $P(B)$ = ...

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$ (c) $\frac{5}{12}$ (d) $\frac{15}{47}$

(56) Let the sample space of a random experiment be $S = \{A , B , C\}$, if $\frac{P(\grave{A})}{P(A)} = \frac{8}{3}$ and $\frac{P(\grave{B})}{P(B)} = \frac{5}{2}$, then $P(C)$ = ...

(a) $\frac{3}{11}$ (b) $\frac{2}{7}$ (c) $\frac{6}{77}$ (d) $\frac{34}{77}$

(57) If A and B are two events of a sample space of a random experiment , $P(\grave{B}) = 0.5$, $P(A \cup B) = 0.8$ and $P(A \cap B) = P(A) \times P(B)$, then $P(A) =$ .....

(a) 0.5 (b) 0.7 (c) 0.4 (d) 0.6

(58) Given that A and B are two events in a sample space of a random experiment , then the probability of occurrence only one of them is .....

(a) $P(A \cup B)$ (b) $P(A \cup \grave{B})$

(c) $P(A \cup B) - P(A \cap B)$ (d) $P(A \cap B)$

(59) If A and B are two events from the sample space of a random experiment S , then the probability of occurrence only one of them is .....

(a) $P(A) + P(B)$ (b) $P(A) + P(B) - P(A \cap B)$

(c) $P(A) + P(B) + P(A \cap B)$ (d) $P(A) + P(B) - 2P(A \cap B)$

(60) If A and B are two events of the sample space of a random experiment , and the probability of occurrence of the event B and non-occurrence of the event A = 0.18 , the probability of occurrence only one of them = 0.43 , then the probability of occurrence of the event A only = ...

(a) 0.25 (b) 0.09 (c) 0.61 (d) 0.7

(61) Four men A , B , C and D are standing in a line , then the probability that (A) stands at one end of the line is .....

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

(62) If the probability that a student succeeds in Mathematics is 0.8 and the probability this student succeeds in French is 0.7 and the probability this student succeeds in both subjects is 0.56 , then the probability of success in Mathematics but not French is .....

(a) 0.24 (b) 0.94 (c) 0.44 (d) 0.2

(63) In a sport club celebration for new stadium , if the probability that the governor attends is 0.8 , and the probability that the minister of youth attends is 0.9 and the probability that both of them attend together is 0.72 , then the probability that at least one of them attends = ...

(a) 0.8 (b) 0.75 (c) 0.98 (d) 0.28

(64) A group of students consists of 48 boys and 32 girls , 18 boys and 8 girls from them joined the scientific section. If one student is chosen randomly , then the probability that the chosen is girl or from scientific section is .....

(a) $\frac{13}{40}$ (b) $\frac{1}{8}$ (c) $\frac{3}{8}$ (d) $\frac{5}{8}$

(65) If A and B are two events of the sample space (S) of a random experiment where $P(B) = \frac{5}{7}$, then $P(\grave{A} \cap B) + P(A \cap B) =$ .....

(a) $\frac{2}{7}$ (b) $\frac{5}{7}$ (c) 1 (d) zero

(66) If A and B are two events of the sample space of a random experiment , $P(A - B) = 0.3$, $P(B - A) = \frac{4}{15}$, $P(\grave{A} \cap \grave{B}) = \frac{1}{5}$, then $P(A \cap B) =$ .....

(a) $\frac{1}{2}$ (b) $\frac{1}{15}$ (c) 0.6 (d) $\frac{7}{30}$

(67) If A , B are two mutually exclusive events in a sample space and $P(\grave{B}) = \frac{3}{4}$, $P\left(S - (A \cup B)\right) = \frac{2}{3}$, then $P(A) =$ .....

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$ (c) $\frac{2}{7}$ (d) $\frac{1}{12}$

(68) If A and B are two events from the sample space of a random experiment and $P(A - B) = P(A \cap B)$, $7\,P(A) = 6\,P(B)$, $P(A \cup B) = \frac{5}{6}$, then $P(A) =$ .....

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

(69) If $P(A) = P(\grave{A})$, $P(B) = \frac{1}{4}$ and $P(A \cup \grave{B}) = \frac{7}{8}$, where A and B are two events of a sample space of a random experiment , then $P(\grave{A} \cup \grave{B}) =$ .....

(a) $\frac{1}{8}$ (b) $\frac{1}{2}$ (c) $\frac{3}{8}$ (d) $\frac{7}{8}$

(70) A box contains 10 white balls , x red balls and y black balls. A ball is drawn randomly from the box and the probability that the ball is white = $\frac{1}{4}$ and the probability that the ball is red = $\frac{3}{5}$, the number of the black balls = ...

(a) 24 (b) 6 (c) 34 (d) 40

(71) If A and B are two events of a sample space of a random experiment , the number of outcomes that causes the occurrence of the event A equals 12 and the number of outcomes that causes the occurrence of the event B equals 16 and the number of outcomes that causes the occurrence of both A and B together is 8 and $P(A \cup B) = \frac{2}{5}$, then $P(\grave{A} \cup \grave{B}) =$ .....

(a) $\frac{2}{7}$ (b) $\frac{8}{25}$ (c) $\frac{21}{25}$ (d) $\frac{1}{2}$

(72) A regular die is designed where two faces on it carry the number 1 and two faces carry the number 3 and two faces carry the number 5 , if this die is tossed twice , then probability of the absolute difference between the two resulted numbers = 2 is .....

(a) $\frac{1}{3}$ (b) $\frac{2}{9}$ (c) $\frac{4}{9}$ (d) $\frac{2}{3}$

(73) If A and B are two events from the sample space of a random experiment , then $P[(A \cap \grave{B}) \cup (B \cap \grave{A})]$ = ...

(a) $P(\grave{A} \cap \grave{B})$ (b) $P(A \cup B)$

(c) $P(A \cup B) - P(A \cap B)$ (d) $P(A) + P(B) - P(A \cap B)$

(74) If A and B are two events from the sample space of a random experiment and $P(A \cap \grave{B}) = \frac{1}{12}$, $P(\grave{A} \cap B) = \frac{5}{12}$, $P(A \cup \grave{B}) = \frac{1}{4}$, then $P(A \cap B)$ = ...

(a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

Second Essay questions

1 If A and B are two events of a sample space of a random experiment , $P(A) = 0.3$, $P(B) = 0.8$ and $P(A \cap B) = 0.2$ **Calculate :**

(1) $P(\grave{A})$ (2) $P(A \cup B)$ (3) $P(A - B)$ (4) $P(\grave{A} \cup \grave{B})$

« 0.7 , 0.9 , 0.1 , 0.8 »

2 A and B are two events in a sample space of a random experiment , if $P(\grave{A}) = \frac{3}{5}$ $P(A \cup B) = 0.45$, **find P (B) in the following cases :**

(1) A and B are two mutually exclusive events.

(2) $A \subset B$ (3) $P(A - B) = 0.2$

« 0.2 , 0.75 , 0.55 »

3 If A , B and C are three mutually exclusive events such that $P(A) = 0.12$, $P(B) = 0.28$ and $P(C) = 0.32$, **find the value of each of the following :**

(1) $P(A \cup C)$ (2) $P(A - C)$ (3) $P(A \cap B)$ (4) $P(C \cap \grave{B})$

(5) $P(A \cup B \cup C)$ (6) $P(A \cap B \cap C)$ (7) $P(A \cup \grave{B})$

« 0.44 , 0.12 , zero , 1 , 0.72 , zero , 0.6 »

4 If A and B are two events of a sample space of a random experiment such that : $P(\grave{A}) = \frac{3}{4}$, $P(A \cap \grave{B}) = \frac{1}{8}$ and $P(\grave{A} \cap \grave{B}) = \frac{3}{8}$, **find each of the following :**

(1) $P(A)$ (2) $P(B)$ (3) $P(\grave{A} - \grave{B})$

« $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{8}$ »

5 If A and B are two events of the sample space (S) of a random experiment , $P(A) = \frac{1}{2}$, $P(B) = x$ and $P(A \cup \grave{B}) = \frac{1}{3}$

(1) Find the value of x in each of the following cases :

(i) A and B are mutually exclusive events. (ii) $A \subset B$

(2) If $x = \frac{1}{4}$, **find the value of :** $P(A \cap B)$

« $\frac{1}{6}$, $\frac{2}{3}$, $\frac{1}{12}$ »

6 If A and B are two events of the sample space (S) of a random experiment.

$P(B) = \frac{4}{5} P(A)$, $P(A - B) = 0.24$, $P(B \cap \grave{A}) = 0.15$

Find : $P(A)$, $P(B)$, $P(A \cup B)$, $P(\grave{A} \cup \grave{B})$ « 0.45 , 0.36 , 0.6 , 0.79»

---

7 If $(S) = \{A , B , C , D\}$ is the sample space of a random experiment,

Find : $P(A)$, $P(B)$ given that : $P(A) = 3 P(B)$, $P(C) = P(D) = \frac{7}{18}$ « $\frac{1}{6}$, $\frac{1}{18}$ »

---

8 If A and B are two events of a sample space (S) of a random experiment where

$P(A) = 0.65$, $P(\grave{B}) = 0.25$ and $P(A - B) = 0.05$

Find the probability of each of the following events :

(1) The occurrence of B

(2) The non-occurrence of A

(3) The occurrence of B only

(4) The occurrence of one of the two events at most.

(5) The non-occurrence of any event A or B

(6) The non-occurrence of the event A or the occurrence of B

(7) The non-occurrence of the event A and the occurrence of the event B

« 0.75 , 0.35 , 0.15 , 0.4 , 0.2 , 0.95 , 0.15 »

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9 If A and B are two events of the space (S) of a random experiment , and

$P(\grave{A}) = \frac{1}{3} P(A)$, $P(B) = \frac{1}{2}$, $P(\grave{A} \cup \grave{B}) = \frac{5}{8}$ **Find :**

(1) The probability of occurrence of one of the two events at least.

(2) The probability of occurrence of one of the two events at most.

(3) The probability of occurrence of the event B only.

(4) The probability of occurrence of only one of the two events. « $\frac{7}{8}$, $\frac{5}{8}$, $\frac{1}{8}$, $\frac{1}{2}$ »

---

10 If A and B are two events of the sample space (S) of a random experiment , and the probability of occurrence of the event A = 0.5 and the probability of occurrence of the event B = 0.6 and the probability of non-occurrence of the two events together = 0.8 , **then find :**

(1) The probability of occurrence of the events A and B together.

(2) The probability of occurrence of one of the two events at least.

(3) The probability of occurrence of the event B and the non-occurrence of the event A

« 0.2 , 0.9 , 0.4 »

11 A and B are two events in a sample space for a random experiment , if $P(A) = \frac{2}{3} P(B)$, the probability of the occurrence of one of them at most equals 0.75 , the probability of the occurrence of one of them at least equals 0.6

Find the probability of the following events :

(1) The occurrence of both of them all together.

(2) The occurrence of only one of them.

(3) The occurrence of B or the non-occurrence of A « 0.25 , 0.35 , 0.91 »

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12 Three horses A , B and C are in a race. The probability that A wins equals double the probability that B wins and the probability that B wins equals double the probability that C wins. If one horse only wins in this race , **find :**

(1) P (A wins)

(2) P (C wins)

(3) P (A or B wins)

(4) P (B and C wins) « $\frac{4}{7}$, $\frac{1}{7}$, $\frac{6}{7}$, zero »

---

13 Two players A and B shoot at a target in the same time.

If the probability that A hits the target is $\frac{2}{5}$, the probability that B hits the target is $\frac{1}{4}$, and the probability that A and B hit the target together is $\frac{1}{10}$

Find the following probabilities :

(1) A_1 is the event of hitting the target.

(2) A_2 is the event of hitting the target by B only.

(3) A_3 is the event of not hitting the target.

(4) A_4 is the event of hitting the target by one of A and B at most.

(5) A_5 is the event of hitting the target by one only from A and B « $\frac{11}{20}$, $\frac{3}{20}$, $\frac{9}{20}$, $\frac{9}{10}$, $\frac{9}{20}$ »

---

14 The probability that a student succeeds in history is 0.4 , the probability that he succeeds in Arabic is 0.45 and the probability that he succeeds in both subjects is 0.18

Find the probability that he :

(1) Succeeds in history only.

(2) Fails in both subjects.

(3) Succeeds in at most one of the two subjects.

(4) Succeeds in one subject at least.

(5) Non-succeeds in both subjects together. « 0.22 , 0.33 , 0.82 , 0.67 , 0.82 »

15 The probability that Hassan succeeds is mathematics is 0.72 , the probability of his failure in physics is 0.37 and the probability of his success in one of the two subjects at least is 0.88 , **find the following probabilities :**

(1) Hassan succeeds in both subjects.

(2) Hassan succeeds in at most one of the two subjects.

(3) Hassan succeeds in one only of the two subjects.

(4) Hassan fails in the two subjects.

« 0.47 , 0.53 , 0.41 , 0.12 »

---

16 A die is designed such that the probabilities of getting odd numbers are equal , probabilities of getting even numbers are equal too and the probability of getting an even number = $\frac{1}{3}$ the probability of getting an odd number.

If this die is tossed once , find the probability of getting each of the six numbers , **then calculate the probability of each of the following events :**

(1) A : The event of getting a prime number and not an even number.

(2) B : The event of getting a number < 3

(3) C : The event of getting an even number ≥ 4

« $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$ »

---

17 A die is designed such that the probability of appearance of any number on the upper face = K × the number itself where the constant K ≠ 0

If this die is thrown once , **find the probability of each of the following events :**

(1) A : The event of appearance of an odd number.

(2) B : The event of appearance of an even number.

(3) C : The event of appearance of a prime odd number.

(4) D : The event of appearance of a number not divisible by 3

« $\frac{3}{7}$, $\frac{4}{7}$, $\frac{8}{21}$, $\frac{4}{7}$ »

---

18 **Join with sport :**

A coach of one of the sports teams says in a news briefing that the probability that his team wins in the away match is (0.7) , the probability of winning in the rematch is (0.9) and the probability of winning both matches is 0.5

Does the concept of probability agree with the words of the coach ? Justify your answer.

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19 A and B are two events in a sample space S and P is a probability function on S such that $P(A) = x$, $P(\acute{B}) = 4x$ and $P(A \cup B) = 6x - 0.4$, **then find (for each case) the value of x if :**

(1) A and B are mutually exclusive events.

(2) $A \subset B$

(3) $P(A \cap B) = \frac{4}{5}x$

« $\frac{7}{45}$, 0.14 , $\frac{1}{7}$ »

20 If A , B are events in a sample space S and P is a probability function on S such that :

$P(A \cup B) = 0.58$ and $P(A \cap B) = 0.12$

If $P(A \cap B) = P(A) \times P(B)$, then find P (A) and P (B) « 0.3 , 0.4 or 0.4 , 0.3 »

---

21 In an experiment , a die is thrown once and the apparent number on the upper face is observed. **Calculate each of the following probabilities**

(1) A : The event of the appearance of the number 5

(2) B : The event of the non-appearance of the number 3

(3) C : The event of the appearance of a number > 2

(4) D : The event of the appearance of a number greater than 4 or less than 3

(5) E : The event of the appearance of a number greater than 2 and less than 3

(6) 📖 F : The event of the appearance of a number is a factor of 6

(7) 📖 G : The event of the appearance of an odd number divisible by 3

« $\frac{1}{6}$, $\frac{5}{6}$, $\frac{2}{3}$, $\frac{2}{3}$, zero , $\frac{2}{3}$, $\frac{1}{6}$ »

---

22 📖 A fair die is thrown once , written on its upper faces the numbers 8 , 9 , 10 , 11 , 12 , 13 with observing the number on the upper face :

(a) Find the probability of each of the following events :

(1) A : The event of the appearance of an odd number.

(2) B : The event of the appearance of a prime number.

(3) C : The event of the appearance of an even number.

(4) D : The event of the appearance of a number greater than 12

(5) E : The event of the appearance of a number consists of two digits.

(6) F : The event of the appearance of a number consists of only one digit.

(b) Calculate : $P(A \cup C)$, $P(E \cup F)$, $P(B \cap D)$ « $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{1}{6}$, $\frac{2}{3}$, $\frac{1}{3}$, 1 , 1 , $\frac{1}{6}$ »

---

23 📖 **A set of 30 identical cards numbered from 1 to 30, a card drawn randomly with observing the number on the upper face calculate the probability that the number written on the drawn card is :**

(1) A number is divisible by 3

(2) A number is divisible by 5

(3) A number is divisible by 3 and 5

(4) A number is divisible by 3 or 5

(5) Even number divisible by 3

(6) Odd number and perfect cube.

(7) Prime number less than 15

(8) A number contains 2 or 3 in its digits.

« $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{15}$, $\frac{7}{15}$, $\frac{1}{6}$, $\frac{1}{15}$, $\frac{1}{5}$, $\frac{1}{2}$ »

24 A bag contains 50 likely balls. 25 balls of them are white and numbered from 1 to 25 , 15 balls are red and numbered from 1 to 15 and the remainder is blue and numbered from 1 to 10 A ball is drawn randomly from the bag.

Calculate the probability that the drawn ball :

(1) Is red or white.

(2) Is red and carries an even number.

(3) Carries a number less than or equal 8

(4) Carries a number less than or equals 12

(5) Carries a number greater than or equals 14

(6) Carries the number n where $6 \leq n \leq 20$

« 0.8 , 0.14 , 0.48 , 0.68 , 0.28 , 0.6 »

---

25 A bag contains 3 black balls and 3 red balls If 3 balls are drawn randomly without replacement. **Find the probability of each of the following :**

(1) A : Getting at most 2 red balls.

(2) B : Getting 2 balls exactly having the same colour.

(3) C : Getting at least 2 red balls.

(4) D : Getting exactly 2 consecutive red balls.

«$\frac{7}{8}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$»

---

26 **In an experiment of throwing a fair coin three successive times , find the probability of the following events**

(1) A : The occurrence of 2 heads at least.

(2) B : The occurrence of one tail only.

(3) C : The occurrence of two tails exactly.

(4) D : The occurrence of a head in the first toss and a tail in the second toss.

(5) E : The occurrence of two consecutive heads at least.

(6) F : The occurrence of odd number of the heads.

(7) G : The occurrence of one tail at least.

«$\frac{1}{2}$, $\frac{3}{8}$, $\frac{3}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{7}{8}$»

---

27 In the experiment of tossing a coin and a die and observing the apparent outcome on the upper face of each , **find the probability of each of the following events**

(1) A : Getting a tail and an odd number.

(2) B : Getting a number that is not prime.

(3) C : Getting a head.

(4) D : Getting a tail or a number < 3

(5) E : Getting a tail and a number < 3

«$\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{1}{6}$»

28 In the experiment of tossing a coin and a die and observing the upper faces , if (A) is the event of the appearance of a head and a prime number , B is the event of the appearance of even number , calculate the probability of each of A and B , **then calculate the probability of the following events :**

(1) The occurrence of one of the two events at least.

(2) The occurrence of the two events together.

(3) The occurrence of the event B only.

(4) The occurrence of one of the two events only. « $\frac{1}{4}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{1}{12}$, $\frac{5}{12}$, $\frac{7}{12}$ »

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29 A die is designed such that two faces carry the number 2 , two faces carry the number 4 and two faces carry the number 6 If this die is tossed twice , write down the sample space of this experiment. If A is the event of appearance of the number 2 in the first toss and B the event of the absolute difference between the two numbers in the two tosses is 2 determine each of A and B , **then find each of :**

(1) $P(A \cap B)$ (2) $P(A \cup B)$ (3) $P(\grave{A} \cap \grave{B})$ « $\frac{1}{9}$, $\frac{2}{3}$, $\frac{1}{3}$»

---

30 In an experiment of tossing a fair die two consecutive times with observing the number on the upper face , **calculate the probability in each of the following events :**

(1) A : The event of the appearance of number 4 in the 1st toss.

(2) B : The event of the sum of two numbers in the tossing equals 8

(3) C : The event of the sum of the two numbers in the two tosses less than or equal 5

(4) D : The event of the sum of the two numbers is divisible by 6

(5) E : The event of the absolute difference of the two numbers is a prime number.

(6) F : The event of the appearance of number 3 one time at least.

(7) G : The event of the appearance of an odd number in the 1st toss and an even number in the 2nd toss. « $\frac{1}{6}$, $\frac{5}{36}$, $\frac{5}{18}$, $\frac{1}{6}$, $\frac{4}{9}$, $\frac{11}{36}$, $\frac{1}{4}$»

---

31 We have two distinct fair dice. One of them carries the numbers 1 , 1 , 3 , 3 , 6 , 6 on its face and the second carries the numbers 2 , 2 , 4 , 4 , 5 , 5 on its face.

If the two dice are thrown once , find the probability of the following events

(1) A : The event of appearance of two odd numbers.

(2) B : The event of the sum of the two apparent numbers is greater than or equals 7

(3) C : The event of the sum of the two apparent numbers is even. « $\frac{2}{9}$, $\frac{5}{9}$, $\frac{4}{9}$»

32 From the set $\{0, 1, 2, 3, 4\}$, a number is formed with two different digits.

Calculate the probability of :

(1) A : The event «The number is even or the tens digit is odd»

(2) B : Both digits are prime numbers.

(3) C : The units digit or the tens digit is a prime number.

«$\frac{3}{4}$, $\frac{1}{8}$, $\frac{3}{4}$»

---

33 If S is the sample space of a random experiment whose outcomes are equally likely, A and B are two events from S, $P(A \cup B) = \frac{5}{6}$, $P(B) = \frac{5}{12}$, the number of outcomes that causes of occurrence of the event A equals 13 and the number of possible outcomes of the experiment equals 24, **find :**

(1) The probability of occurrence of both A and B together.

(2) The probability of occurrence of one only of the two events.

(3) $P(\hat{A} \cup \hat{B})$

«$\frac{1}{8}$, $\frac{17}{24}$, $\frac{7}{8}$»

---

34 A class contains 40 students. 30 of them succeeded in philosophy, 24 students succeeded in history and 20 students succeeded in both. A student is chosen randomly.

Find the probability that this student

(1) Succeeded in philosophy.

(2) Succeeded in history.

(3) Succeeded in at least one of the two subjects.

(4) Failed in history.

(5) Failed in both philosophy and history.

«$\frac{3}{4}$, $\frac{3}{5}$, $\frac{17}{20}$, $\frac{2}{5}$, $\frac{3}{20}$»

---

35 🕮 A random sample consists of 60 persons in a survey, it is found that 40 of them encourage Al Hilal club, 28 of encourage El negma club and 8 of them don't encourage any of them. A person is chosen at random from the sample. Find the probability that the chosen person encourages :

(1) At least one of the two clubs.

(2) Both clubs.

(3) Al Hilal club only.

(4) Only one of the two clubs.

«$\frac{13}{15}$, $\frac{4}{15}$, $\frac{2}{5}$, $\frac{3}{5}$»

36 A class contains 24 boys and 16 girls. 9 boys and 4 girls use glasses. One person is selected randomly from this class.

Find the probability that the person :

(1) Is a girl.

(2) Uses glasses.

(3) Is a girl who uses glasses.

(4) Is a boy who doesn't use glasses.

(5) Is a girl or uses glasses.

« $\frac{2}{5}$, $\frac{13}{40}$, $\frac{1}{10}$, $\frac{3}{8}$, $\frac{5}{8}$ »

---

37 **In a poetry competition for 2nd secondary students in a mixed school the competitors are distributed as shown in the table. Calculate the probability that the winner student is :**

	Art section	Scientific section	Sum
Boy	8	7	15
Girl	6	4	10
Sum	14	11	25

(1) a girl.

(2) from the scientific section.

(3) a boy from the art section.

(4) a girl or from the art section.

« $\frac{2}{5}$, $\frac{11}{25}$, $\frac{8}{25}$, $\frac{18}{25}$ »

---

38 Tarek wrote 75 letters on the write machine he found that 60% of them is without wrongs , Zeyad wrote another 25 letters and found 80% of them without wrongs , if one letter is chosen randomly of all letters written by both Tarek and Zeyad

, find the probability that the chosen letter is :

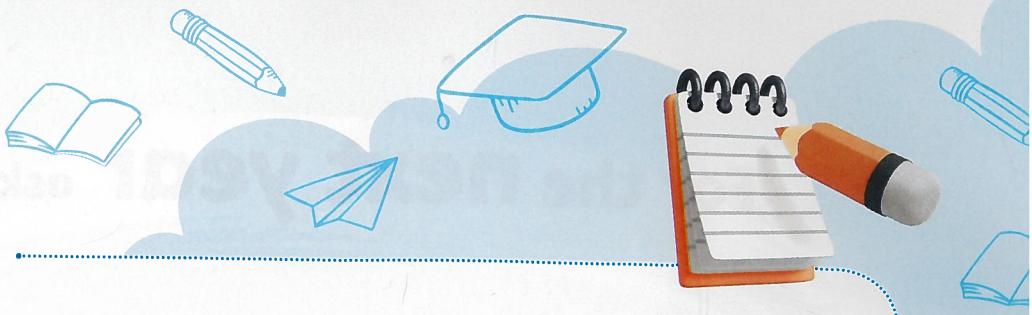
(1) Without wrongs.

(2) Written by Zeyad.

(3) Written by Zeyad without wrongs.

(4) Written by Tarek with wrongs.

« 0.65 , 0.25 , 0.2 , 0.3 »



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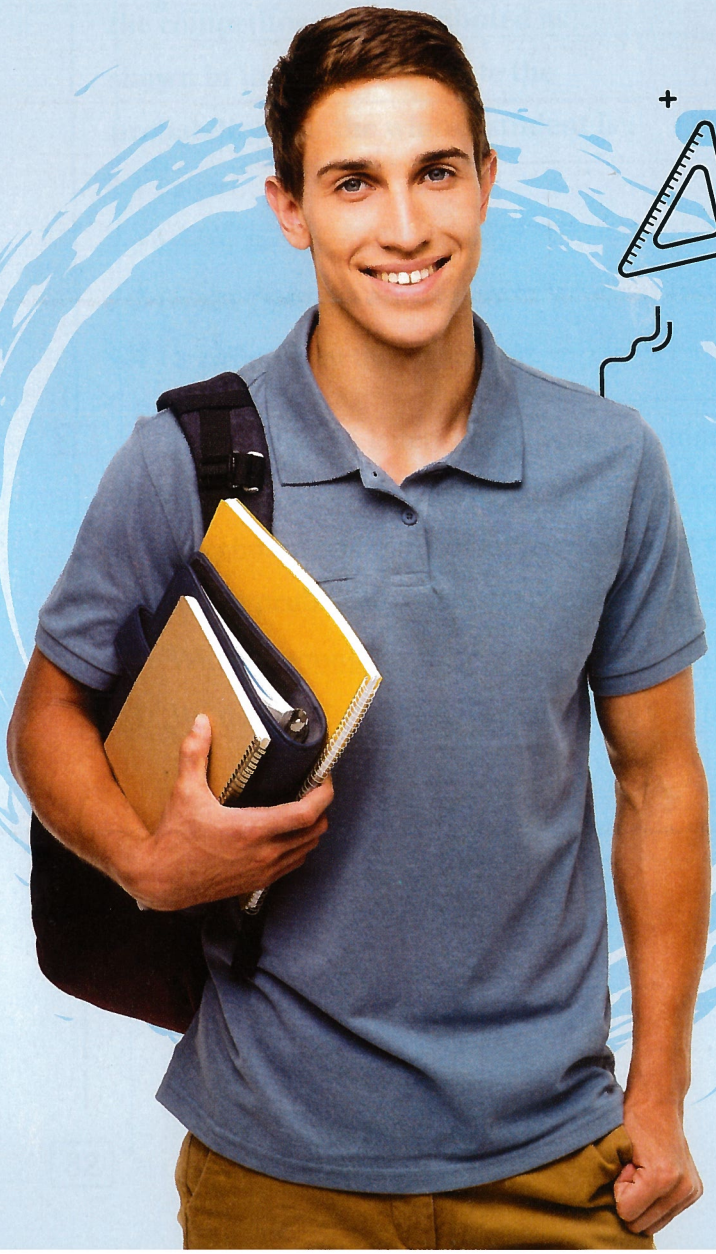

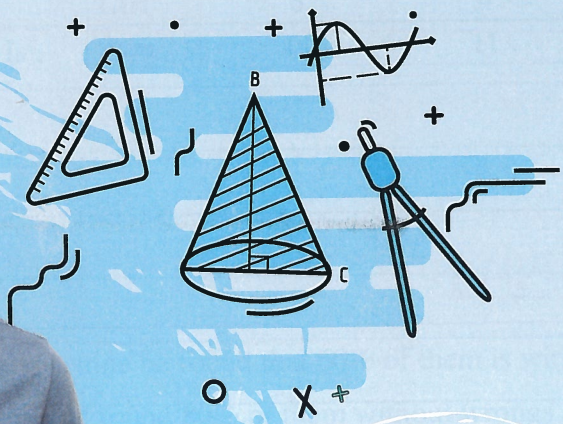

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